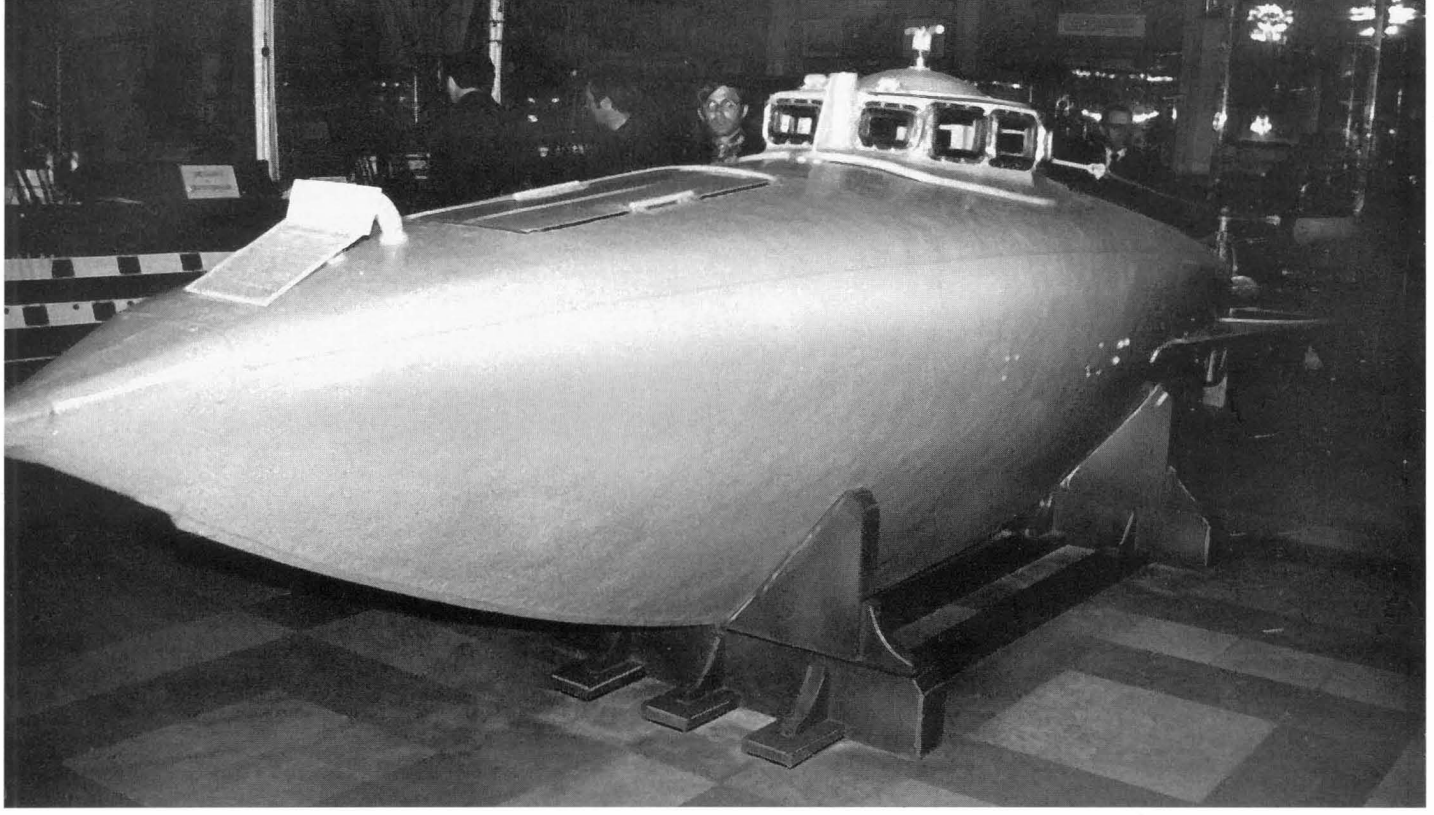
SOVIET AND RUSSIAN NUCLEAR SUBMARINES

WILFRIED KOPENHAGEN

Kopenhagen
Soviet and Russian Nuclear Submarines
Schiffer Military/Aviation History

Ready to put out to sea: that was the original caption for these photos in a Soviet military journal.



Diving boat designed by Dshevetzko in 1881, displayed at the Marine Museum in St. Petersburg. Photo: Kopenhagen

Soviet and Russian Nuclear Submarines

Wilfried Kopenhagen

Propaganda instead of names, dates, facts. The subscribers of the Soviet naval journal "Morskoi Sbornik" were somewhat surprised to read in the third 1990 issue, under the picture of a ship, not only some general information about its equipment, but also that this atomic submarine had a water displacement of 4,300 cubic meters, a length of 102 meters, a width of 11 meters, and a draught of 8 meters.

The photo caption also stated that 20 of the 50-man crew were officers, and that the ship was armed with six torpedo tubes for use against submarines and surface vessels.

Before Gorbachev's Perestroika, such a report with data and facts would have been impossible. Like rockets of every kind, as well as numerous other weapon stsyems, the subject of warship building in general, and submarine building in particular, was kept under the strictest secrecy.

It is interesting that what was publicized in this report did not go so far as to give the boat's type and name. To judge by the photograph and the data, it could have been a ship of the Project 671 RT (Soviet designation, Victor II Class by NATO code).

In general it can be seen that the multitude of types and their variants or modifications—often looking very similar—and the few informative photos offer much chance of misinterpretation. The author is aware of the fact that this danger may not have been avoided in one or another case as to the types illustrated in this volume, especially as the specialist literature has not been free of confusion. Every factual reference, every correction, will be accepted with gratitude.

In what form, in the times of Soviet power, military-technical propaganda was spread on the one hand, and on the other, strict secrecy was maintained, can be illustrated by the following article—absolutely typical of the Soviet military press of the time—by Captain 3rd Rank Sergei Bystov (reprinted in the weekly journal *Volksarmee*, 39/82).

Ready to Put Out to Sea Again

Only with difficulty can the porthole be opened to the outside. It seemed as if welded after a week's voyage under water. On the Sea Captain Gennadi Nikitin, the commander of the nuclear-powered rocket submarine, fell a sheet of large drops of water when he pushed himself through the tower hatch to the outside.

He breathed the fresh sea air, that tasted good to him, as a thirsty man would drink spring water. Naturally, the air in the sections of the ship is enriched with everything in life, but it cannot replace that naturalness that wind, sea, and land provide.

After the captain, the officer of the watch and the signal guest came onto the bridge. All the other crew members had to be patient until the ship ran into its home support base before coming on deck. They crowded around the periscope, in order to have at least a small glance through the optics at the world outside that had existed for a long time only in their imagination.

For submariners there is no greater pleasure than, after surfacing, seeing everything just the way they left it: peaceful and quiet. For this reason the seamen, mates, and officers put up with the hardships of being cut off from the world by a heavy layer of water while doing their military duty for weeks in the depths of the ocean.

The commander, Gennadi Nikitin, who began his fleet service at the "Nachimov" officer school in Sevastopol, a long voyage under water now ended for the 18th time, and for the 8th time as commander. And it was never monotonous. Combat drills at the stations and in the ship alternated.

They put out fires, stopped leaks, flooded sections, and made sure to avoid contact with "enemy" underwater craft. Naturally, all these situations were only simulated, but the exertions were no less for the crew. After the return of a submarine from a major voyage, it has become a tradition to greet the ship and crew formally in a homeland harbor. All the ships were flagged over the tops. The crews stood along the rails on deck as if on parade. An orchestra played.

The submarine *Lembit*, paid for by contributions from Estonian people in Britain and put into service by the Estonian fleet in May 1937, was taken over by the Baltic Fleet on August 19, 1940, after the country's union with the Soviet Union. It was the only submarine to carry out the underwater ramming of an enemy submarine. Many years after the war, the *Lembit* was still used as a school ship, and since 1978 it has been a floating monument in the harbor of Tallinn.

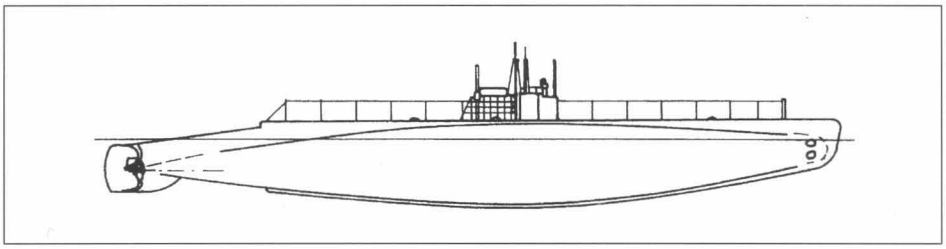
The flotilla chief welcomed the crew. He made an initial inspection of the craft and took a report from the commander about the fulfilling of the combat task.

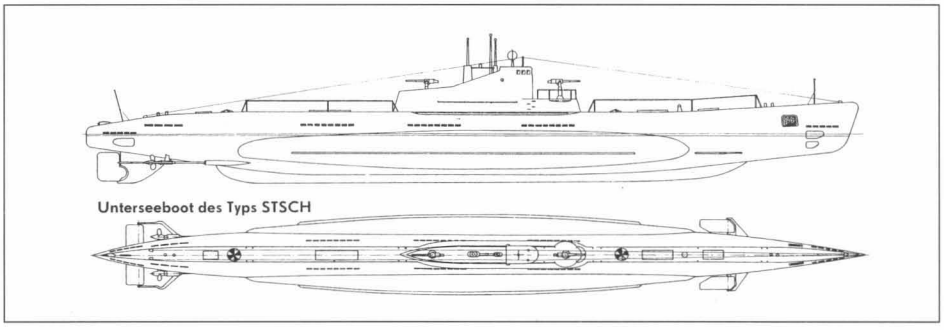
This time, too, everything went just so—to the report. For after the commander's closing words: "The ship is ready to fulfill new tasks," the admiral asked repetitiously: "That means you are ready to put out to sea again?" Sea Captain Nikitin answered with a spirited "Yes indeed!" And the flotilla chief replied: "Very well. You are to prepare your ship for departure immediately and carry out a rocket-firing

The most vital data of the first submarines of the Soviet underwater forces

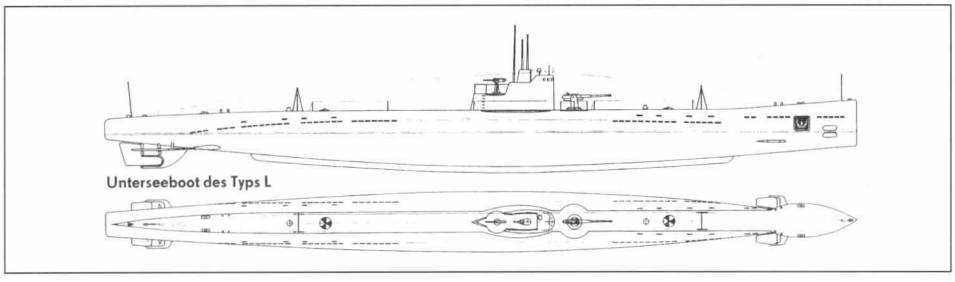
Type	Bars	AG	D	Stscha	L	M-VI	M-XII	S	K
Years built	1912-17	1916-18	1930-33	1934-	1934-	1933-	1935-	1935-	1935-
Displacement (tons)									
surface	650	355	to 1000	580	1100	150	208	780	1500
submerged	780	435	1320	700	1300	210	260	900	1500
length (m)	68	46	73.5	59	81	38	45	78	98
width (m)	4.5	4.8	7	6.2	7	3.1	3.3	6.4	7.4
depth (m)	3.9	3.8	4.2	4	4.2	2.5	2.8	4.4	4.5
Armament (mm)									
artillery	1-57/1-37	1-47	1-100/1-45	1-45	1-45	1-45	1-45	1-100/1-45	2-100/2-45
torpedos	4 TR 450 bow	4 TR 450 bow	6 TR 533 bow	4 TR 533 bow	4 TR 533 bow	2 TR 533 bow	2 TR 533 bow	4 TR 533 bow	6 TR 533 bow
	8 tubes	8 tubes	2 TR 533 stn.	2 TR 533 stn.	20 mines			2 TR 533 stn.	4 TR 533 stn.
Power (HP)									
Diesel motors	500-1,000 480	2,200	1,600	4,100	680	800	4,000	8,400	
Electric motors	840	320	1,050	800	1,500	240	400	2,200	2,400
Speed (knots)									
surface	to 18	13	16	14	16	12	15	20	21
submerged	8.5	10.5	8	8.5	8	6	8.4	8.5	8.5
dive depth (m)	50	50	90	90	90	50	ca. 50	100	10-100
dive time (hrs)	190	180	190	60	70	50	ca. 40	55	60
Range (sm/knots)									
surface	2,500/6	1,750/8	7,000/8	to 4,500/8	7,400/8	1,600/8	3,000/8	7,000/8	ca. 10,000/9
submerged	30/7	25/8	24/8	—	—	—	—	—	—
Crew	33	28	44	40	50	15	18	50	65

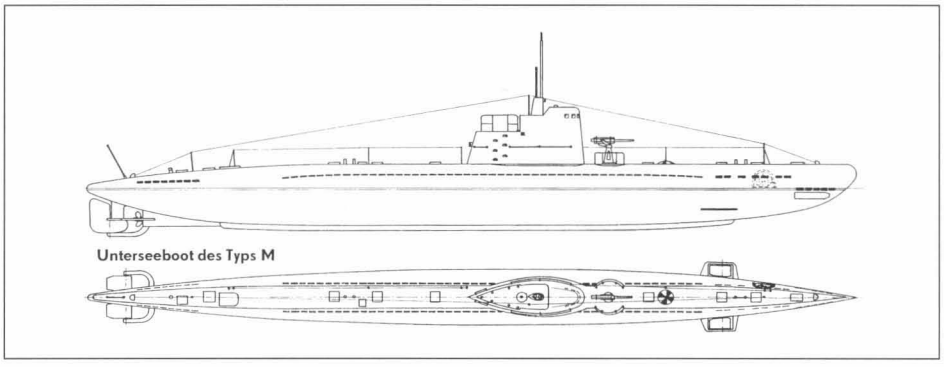
The American submarine *Holland* AG: bought by Russia in the USA in World War I, shipped in a dismantled state to Nikolayev in 1917. Boat AG-21 was ready for service in the spring of 1918, fell into the hands of the Germans when they took Sevastopol on May 2, 1918; that November they turned it over to the British, who scuttled it on April 26, 1919, as the Red Army approached. Nine years later it was raised from 50 meters down, and on December 30, 1930, the boat went into service as the *Metallist* (later A-5) and took part in the war until March 1945.

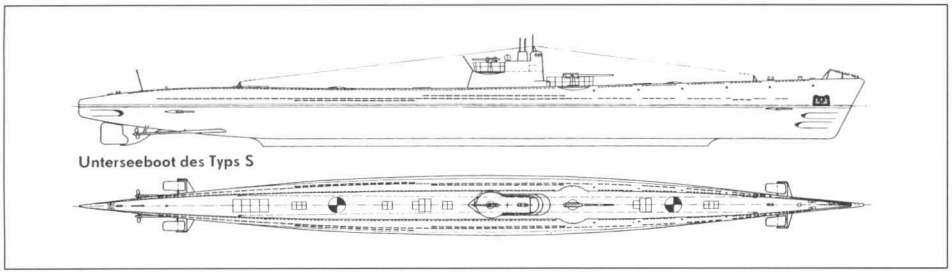


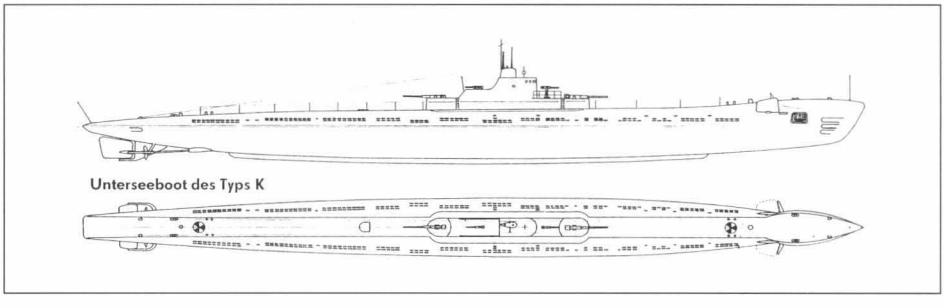


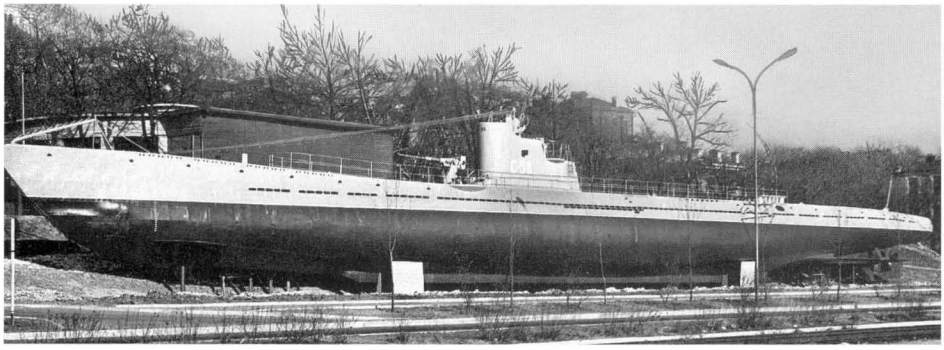
Submarines of the Stscha, L, M, S, and K types, plus the most important technical parameters (sketches from *Heldenschiffe).*











Raised onto mountings at the Korabeiny Shore in Voadivostok in 1972: Submarine S-56. The complete craft had been brought by rail from a shipyard in the Far East, where it had made a test cruise in the autumn of 1941, and went into service on October 31, 1941. After a march of 17,000 nautical miles (Barents Sea, Pacific Ocean, Atlantic, Arctic), S-56 arrived on the Norwegian coast for service, only to return to the Pacific Fleet from the Arctic Fleet after the war ended.

task...." That was unexpected, of course, but it surprised nobody. At once the crew set about preparing their ship....

Hours later, the submarine hastily attained its commanded diving position. The tower hatch was closed, and the diving tanks began to fill with sea water. The needle of the depth meter began to move, the ocean closed over the submarine's hull.

Suddenly, the crossing into the training area was held up by a submarine barrage, a hydroacoustic barrier created by "enemy ships." In order to overcome it unnoticed, the commander and crew had to summon all their experience and knowledge. And they reached the commanded starting point without falling into the hydroacoustic trap.

"Rocket attack!" After the commander's order, all the crew felt the soft vibration of the mighty ship's hull as a fulfillment. An unmistakable sign of the completed launch—and the confirmation of a hit was not long in coming. It released every last sailor's tension.

A little later, the Chief of Staff of the USSR Sea War Fleet appraised the attack as one of the best in the history of nuclear-powered rocket submarines of the North Fleet. The crew had thereby proven again that in their preceding year of training they were the rightful champions of the Sea War Fleet. They were also to be a point of orientation for other crews on their way to military mastery; with them they wanted to finish the year's competition on the sixtieth anniversary of the founding of the USSR.

Thus spoke the newspaper article. (UAW = underwater defense; submarine pursuit; Sea Captain (Kapitän zur See) = Russian Captain First Rank; Fregattenkapitän = Second Rank; Korvettenkapitän = Third Rank. W.K.)

With many similar reports the pride in the fleet, and especially in the atomic submarines, has been built up, but neither anything about the type of craft, nor any close identification of the craft or the rocket, nor their actual technical data, the shipyard or the stationing basis, can be found.

Only after the USSR ceased to exist have numerous publications on this theme appeared (see bibliography).

Thus, it is possible to correct numerous facts and dates in earlier western publications. The losses can also be found in these publications. As for the present-day stand of the Russian submarine fleet, the submarine cemeteries, the dangers that arose through the carelessly disposed-of radioactive material, they have been reported over and over in the media and can be omitted here. This volume, rather, shall offer a concise overview of the development of Soviet and Russian atomic submarines, the institutions and shipyards that created them, and their support points. Since numerous projects crossed, ran parallel, or were carried out in competitions by several institutions, existing series were modified, rebuilt, or further developed, or planned models were never built or never completed, a clear overview of all types is difficult, since a long time has passed and no original designations are known, but only NATO codes.

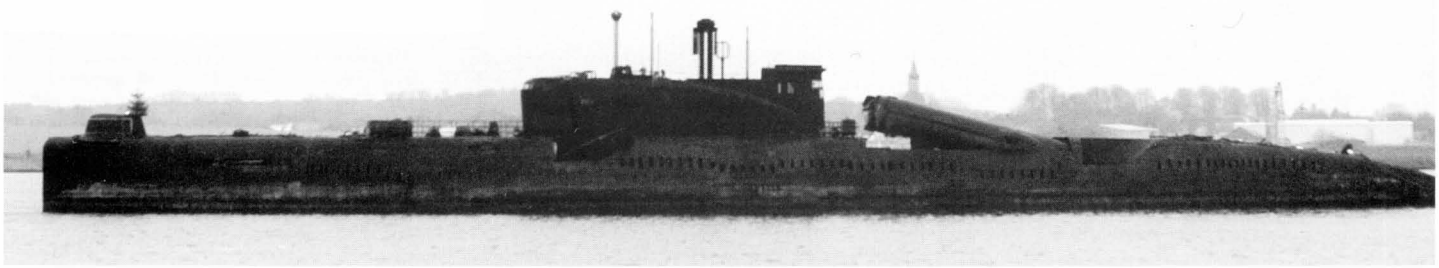
On account of the many models and series, plus the variety of armaments, the precise identification of a type is often difficult (even illustrations often make it so), and all in all, it is not possible, for lack of space, to portray them all thoroughly in one Profile volume.

For that reason, the following pages will cover only the first type, and the largest model, which recently was portrayed in the excellent Russian periodical "Vojeni Parad" (Military Parade, No. 98) in the form of photos, drawings, and technical data.

All other types will be listed in the tables.

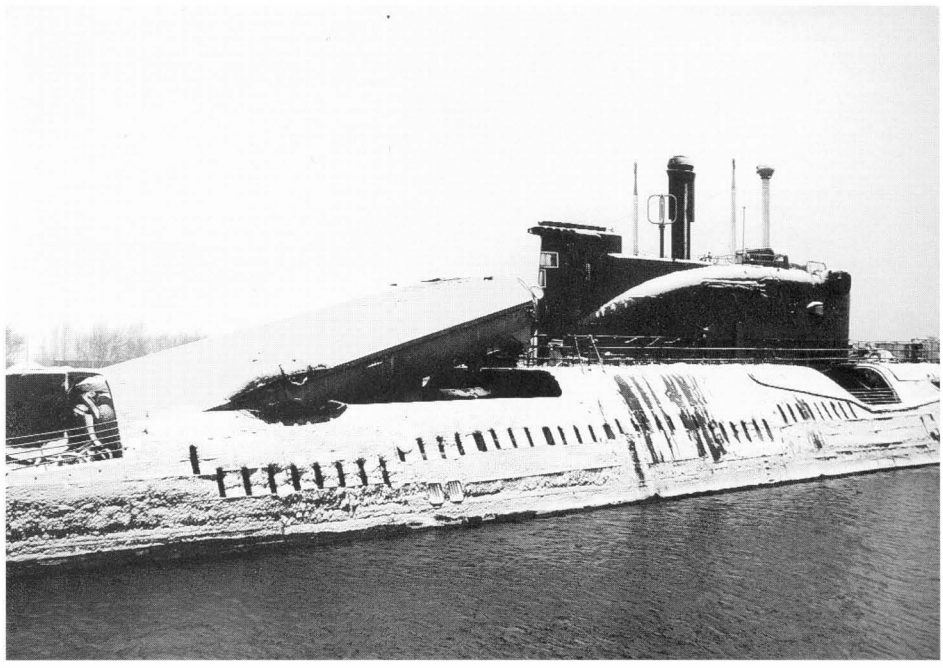
For the sake of completeness—and to offer the reader a more unified view—let us look briefly at the general role of submarines in the history, now 300 years old, of the Russian fleet.

To be seen, and soon to be visited, in the harbor of Peenemünde on the island of Usedom is one of the sixteen Projekt 651 *Juliett*-class Diesel submarines built at the Baltische Werft from 1961 to 1968.



Around the turn of the century, all the greater war fleets of the world included submarines in their arsenal, and this included Russia. Their first combat-capable submarine was launched in 1903. The boat, equipped with four torpedo tubes, had a displacement of 140 tons, a 400 HP engine for surface and a 64 HP electric motor for underwater use.

It is known that in the Russo-Japanese War (1904-05), the 13 submarines sent to Vladivostok by rail saw service with some success. In World War I, as well, the Russian Empire had submarines in its navy, from which, after the USSR was formed, the new naval fleet adopted several older types. Among them were several units of the "Bars" type (designed in 1912 by Prof. I. G. Bubnov), plus five "AG" bought in the USA during the war. In the years of civil and intervention warfare, there were 15—often repaired—submarines available. No new boats were built for the Red Fleet at that time. The first Soviet submarine developments originated about the middle of the twenties: Of the first three Type D (Dekabrist) boats whose keels were laid in 1927, D-1 was launched at Leningrad (now St. Petersburg) on July 12, 1927, and began its service in the Baltic Fleet on November 14 of that year. D-3, which was still in service in World War II, was used by the Papanin expedition to the drifting research station "Nordpol" in February 1938, thus enabling the completion of important scientific research. Also seeing service in the war were the Type L (Leninets) boats, built in various series (including minelayers) from



Fore and aft, the boats had pairs of 20-degree launching ramps for the P-6/SS-N-3a winged rockets.

1933 on, as well as the most numerous type in the Soviet submarine fleet, the Type STSCH (Stschuka Pike, the first three boats begun in 1930). For the Pacific Fleet then being established, the Type Stsch V was intended, and was transported by rail to its destination ports. There followed three further versions (U-b, U-b-2, X and X-b), which are said to have stood out for their great reliability, ruggedness, and seaworthiness.

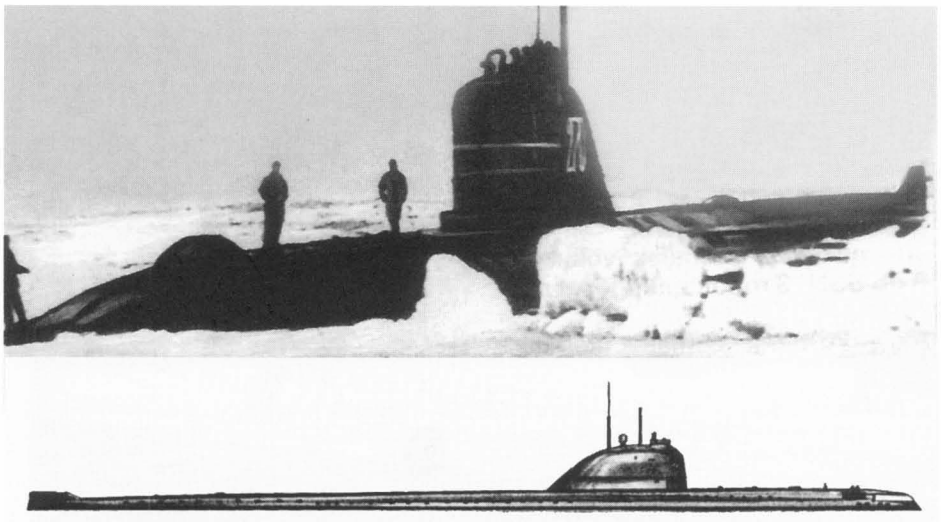
In 1933-36 the small Type M was created for tasks along the shore and developed into the M XII series, which went into service with all the Soviet fleets even before the war; it was to prove itself particularly against the other side's short-range sea traffic.

A qualitatively new step in Soviet underwater forces was the acceptance of the Type S and K submarines. The Type S, built as of 1935 and based on the German Type 1A U-boat, was a large-scale further development of the Stsch type. The S-1 boat—in service as of September 1936—covered a long distance under a closed ice sheet for the first time in January 1940.

The Type K, built since 1937 under the direction of the later Rear Admiral M. Rudnitzki, offered a completely new warship in terms of size, armament, and performance parameters. This outstanding high-sea submarine was also called an underwater cruiser. Boats of this type—the largest submarines built in Soviet yards before and during the war—still remained in service after World War II.

When the war began, the USSR had 218 submarines. According to Soviet statements, Soviet submarines sank 219 enemy ships in the war, with a total tonnage of 476,100 BRT.

The ramps were folded away after the launch. Photos: Olaf Pestov.



"The nuclear powered submarine *Leninski Komsomol* at the North Pole"—thus read the caption for this photo that was seen around the world. It shows the first Soviet atomic submarine (Project 627 K-3, *November* Class) surfaced in the North Pole's ice in July 1962.

During the war, the great effectiveness of submarines had been proven. After 1945, Soviet specialists undertook extensive research to clarify the question of whether strong military undersea forces were capable of equaling the extensive surface fleets of the western allies that opposed the USSR. The specialists came to the conclusion that it would thus be possible for the USSR "to carry out strategic tasks in oceanic directions to defend the land."

This concept was promoted publicly with the expression "blue belt," which the Soviet underwater craft were supposed to form (they could no longer speak of U-boats, what with the sizes involved, and the specialist press often referred to the large atomic-powered submarines as U-ships. For the sake of simplicity, the German term, "U-boat," continues to be used.)

As Fleet Admiral of the Soviet Union S. G. Gorshkov reports in the book *The Sea Power of the Soviet Land* (see bibliography), The USSR's underwater forces developed in two stages after 1945. The first included a period of about ten years. It was marked by the building of underwater craft with greater speed, range, and depth, as well as the improved ability to load acoustic weapons at periscope depth.

High-sea submarines with Diesel-electric powerplants were built, equipped with the most modern observation, radar, and hydroacoustic gear, navigation and communication devices, and highly effective torpedos, and capable of service in oceanic regions.

In the second half of the fifties, some of these postwar series or individual boats were modified and armed with ballistic or winged rockets, the first of which were based on the V 1 and V 2 (A 4) rockets captured in Germany and copied in Russia.

To this day, potent Diesel-electric submarines are part of the GUS fleet, and in the form of the exported KILO class they also belong to the present-day Russian shipbuilding program.

It should not go unnoticed that NATO ships, even some years after the war, occasionally reported meeting "ancient" submarines. In *Soldat und Technik,* No. 8, 1985, it is noted that in November 1984 a submarine of the prewar S Class was sighted (and naturally photographed) in the Baltic Sea—though it was obviously being used for filming.

For the sake of completion it should be noted that among the submarines that gathered as memorials to the wartime (example: S56 in Vladivostok), there were also those that were not built

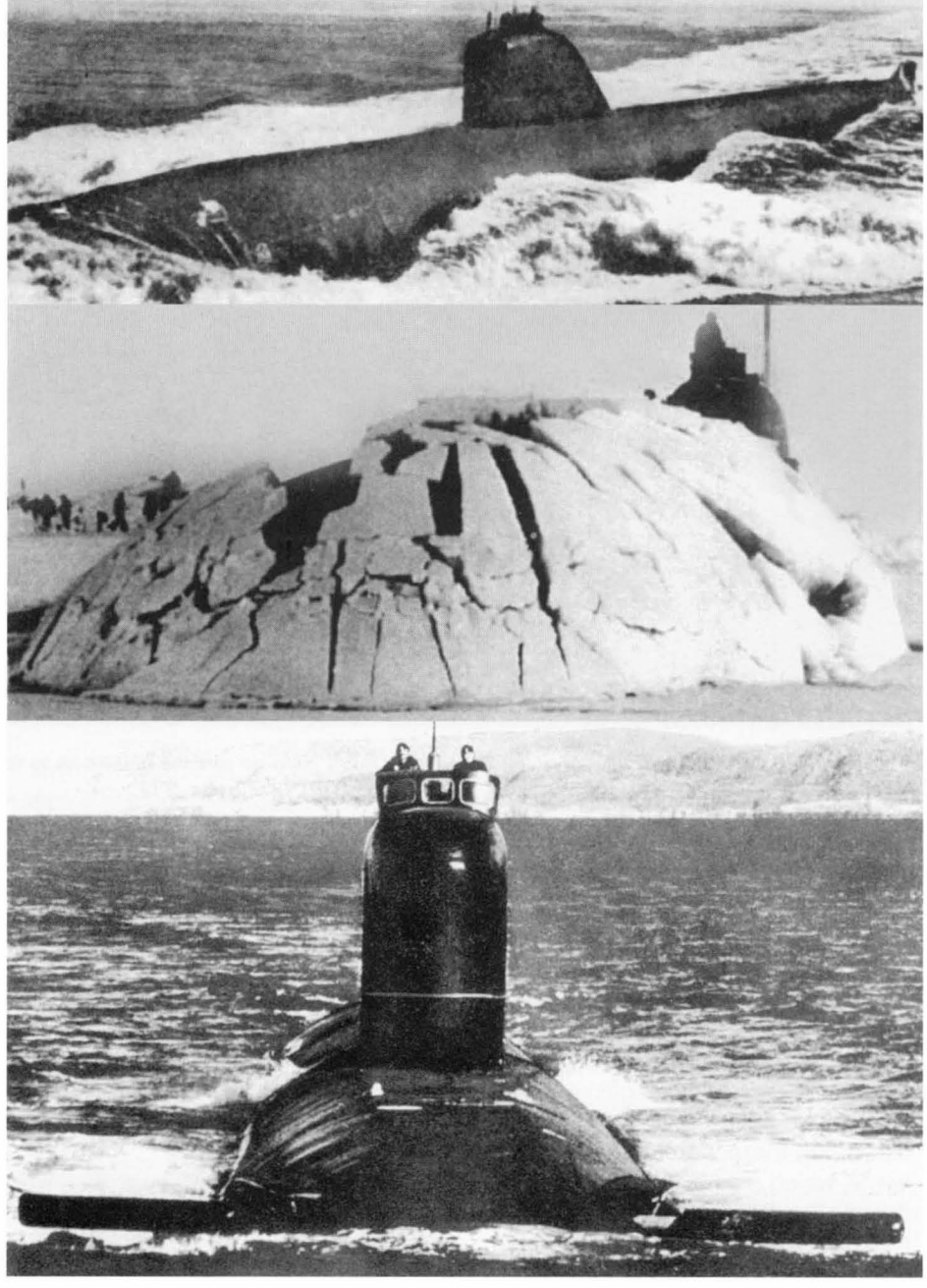
This picture is taken from the photo documentation "50 Years of USSR Armed Forces" (Moscow, 1967). The caption states that this crew of an atomic submarine was decorated with orders and medals, and Rear Admiral A. I. Petelin, as leader of the undertaking, Commander Captain 23nd Rank L. M. Shilzov and the Chief Engineer, Captain 3rd Rank R. A. Timofeyev (without giving names and ranks, from left to right) received the title "Hero of the Soviet Union." Actually, this was the honoring of the North Pole voyage of K-3 in July 1962, during which some 1,300 of 3,151 nautical miles were traversed under the polar icecap.

until after 1945. A first example of this is the submarine mounted on blocks in Odessa around 1985; it was marked M-305 and was one of thirty Quebec Class boats built in the fifties.

Recently, in Germany, too—more precisely since the beginning of January 1999—a former Soviet submarine—Project 651 Juliet Class—has been on display in the harbor of Peenemünde, and can soon be boarded.

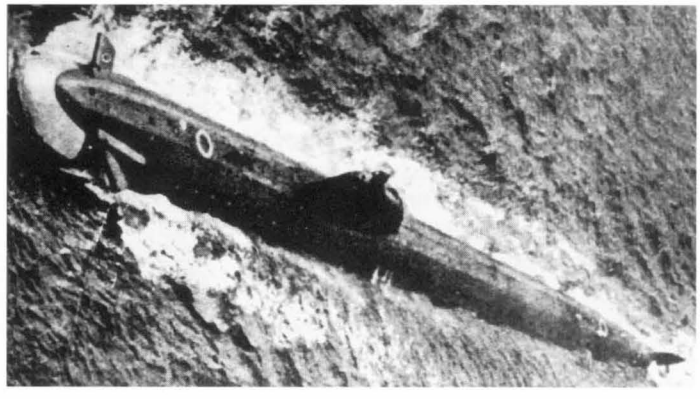
But back to the postwar development of Soviet submarines.

The second stage, beginning at the end of the fifties, was typified by the building of large nuclear-powered submarines which—to put it bluntly—basically changed the combat possibilities of underwater forces. Fleet Admiral Gorshkov summed up the standpoint of the party, state, and fleet leadership at the time thus: "The Soviet nuclear-powered undersea ships are first-class warships for any purpose, whose fighting capabilities allow the carrying out of a large spectrum of tasks on the high seas. They are not only carriers of tactical weapons, but also essential components of the Soviet Union's strategic shield of nuclear weapons. The aggressors know that, too. They must reckon, in the case of a nuclear-weapon war brought on by them, on the serious results of retaliation from the oceans. The outstanding qualities of the Soviet Union's nuclear-powered undersea ships have been shown in many maneuvers and on long voyages. The Soviet travelers reached the North Pole more than once. A group of nuclear-powered U-ships carried out

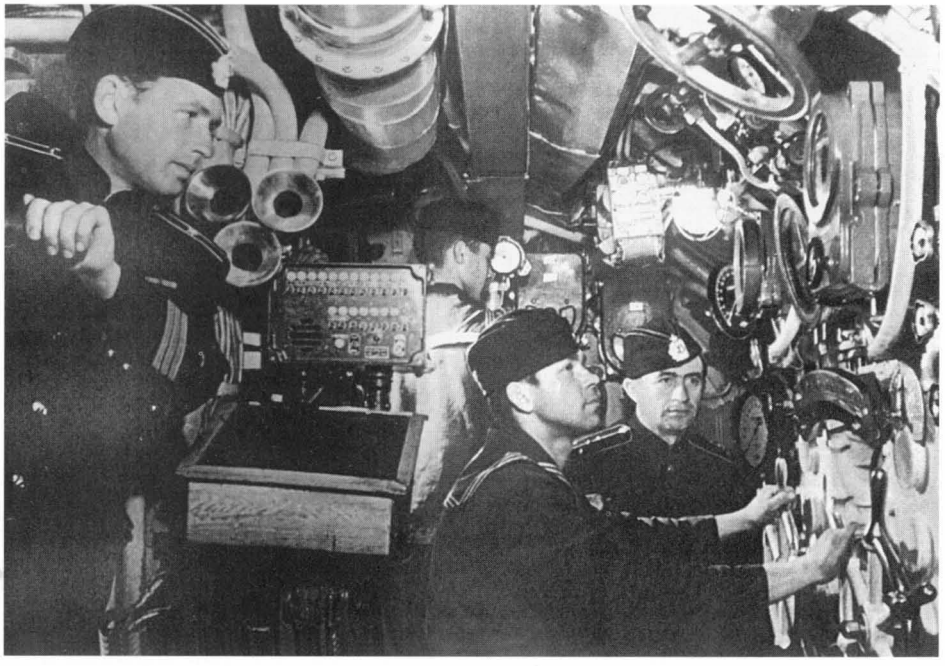


Only a few photos, with captions that said little, reached the press from the further polar voyages in September 1963 (K-115 and K-181, both Project 927A), or from the round-the-world voyages of two Soviet atomic submarines in 1966.

In the Bay of Biscay, NATO reconnaissance craft "shot" this photo of K-8, on which a fire broke out on April 8, 1962. By the time it surfaced, 30 of its 125-man crew had lost their lives. In all, 73 crewmen could be rescued before it sank on April 12, 1972.



A Project 627A/November submarine, then still called N Class in the West.



Photos of submarine crews published by the Soviet Union gave no precise details as to the type of units.

the unique achievement of going around the world without surfacing."

It might be said that when he created the "Nautilus" over 100 years ago, Jules Verne was thinking of a boat with similar performance. Since the first Soviet atomic submarine was built, the role of this new type of warship has been exalted again and again with similarly heroic words in the USSR's media. When there were failures or accidents, which are not always advisable, despite the greatest caution, they were reported, with the greatest reservation, only when it was absolutely unavoidable.

Gorshkov referred in his comments to the voyage of the atomic submarine K-3, which had surfaced at the North Pole in July 1962. It was one of the first-generation Soviet submarines, the history of which deserves a brief look now.

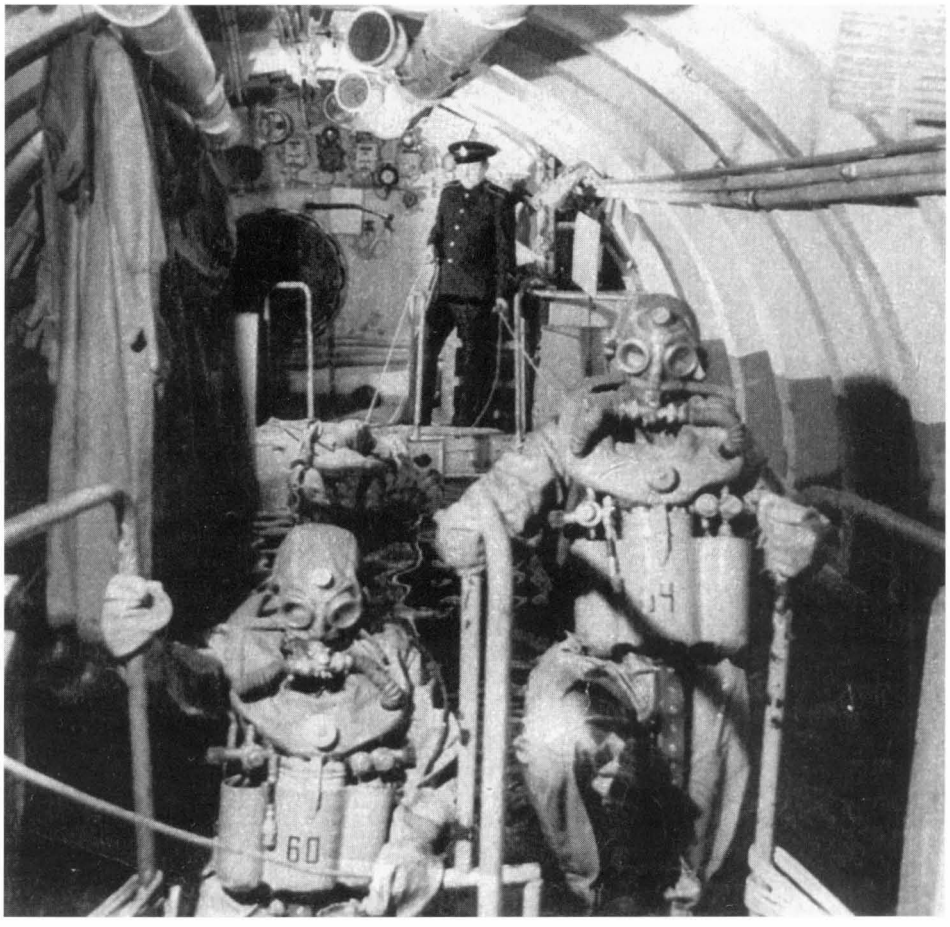
According to information from the USAA about the events in the study of nuclear energy and its use in the military sector (the USA's first atomic submarine had been put into service), the powers that ran the Soviet Union insisted on their own successful results.

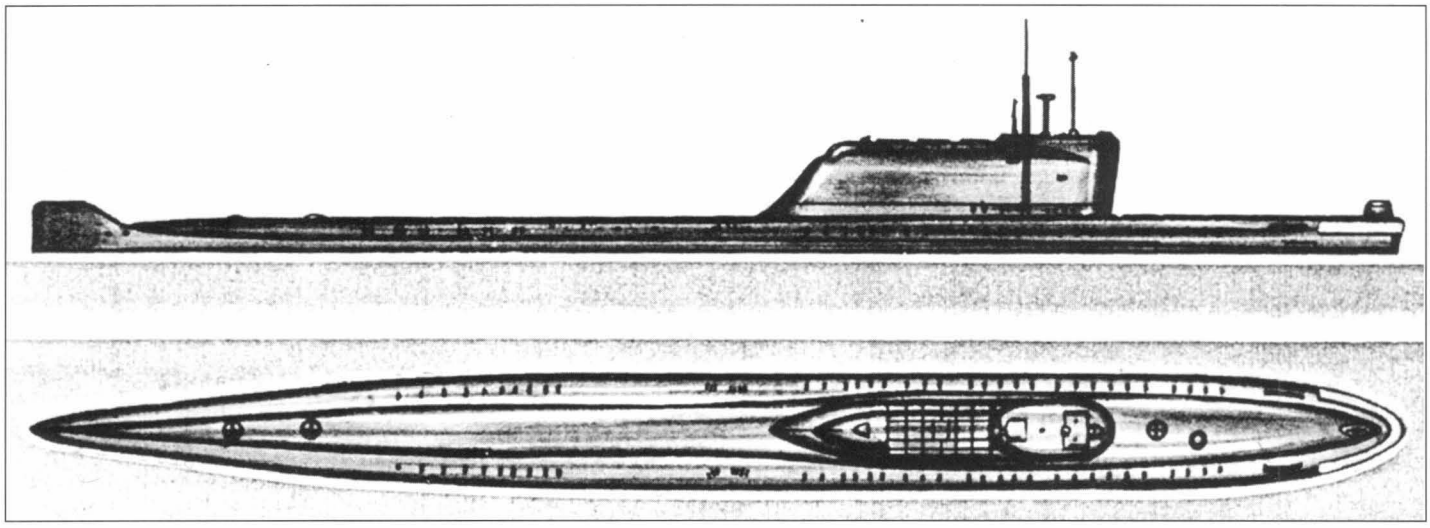
The official basis was the government decision of September 9, 1952, about the building of an atomic submarine. Preliminary work had been done by physicists under Academy member Igor Kurtshatov; by the end of the forties, they had already modified the AM nuclear reactor, version WMF, projected for the first Soviet atomic power station in Obninsk, 90 kilometers south of Moscow, for naval use.

The project that they began in March 1953 involved arming a boat with a torpedo that could attack targets on enemy shores with a torpedo carrying a thermonuclear warhead. The weapon, designated T-15, was to be some 23.5 meters long and have a diameter of some 1.6 meters, since there was as yet no nuclear weapon small enough for the traditional 533 mm torpedo. Traditional torpedos were to be carried for self-defense.

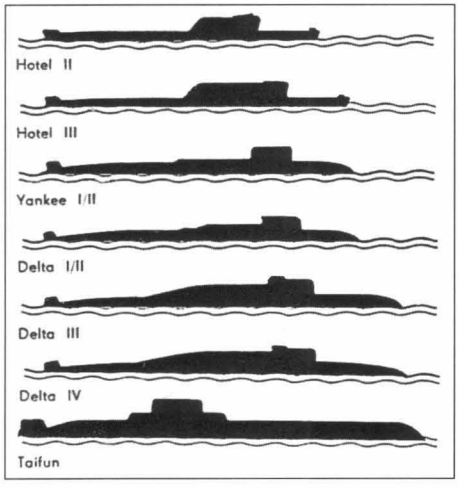
For the boat, designated Project 627, the vessels of Project 611/ZULU served as models. The T-15 torpedo tube was to be located at the bow in order to cause as little resistance as possible. For the boat with a planned underwater speed of 25 knots, a diving depth of 300 meters, and a maximum operation time of 60 days at sea, work was carried on at numerous institutes, companies, and reserach facilities, at which, for example, new steel alloys, as well as navigational and sound-reducing materials were developed. Problems involving traveling as quietly as possible or using atomic power were solved. Thus, the designers decided in favor of two reactors (the Americans had gambled on using just one reactor) and two propellers. Along with other advantages, the two-shaft setup was to guarantee higher speeds than the Americans had.

As of May 1954, the naval leadership could approve and evaluate the





In the Oroject 558/HOTEL class atomic submarine, the rockets housed in the tower were fired from a surface position. The boats were reequipped and modernized several times in terms of weapons technology.



Development of strategic submarines with nuclear power

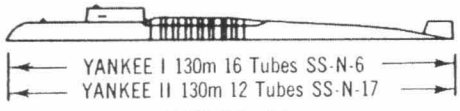
Year	U.S. SSBN	SLBM shafts	Warheads	USSR SSBN	SLBM shafts	Warheads
1960	3	48	48	none	none	none
1967	41	656	1,552	2	32	32
1970	41	656	2,048	20	316	316
1975	41	656	4,536	55	724	724
1981	40	648	5,280	62	950	2,000
1984	39	656	6l,000	62	940	2,500
1986	38	672	7,000	61	922	3,000

Size comparison of several types of nuclear-powered underwater units of the USSR and vessels with ballistic rockets with American types.

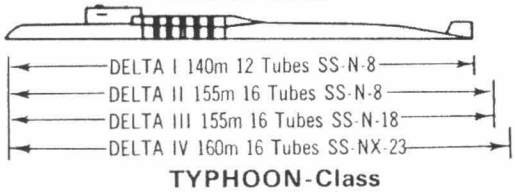
Nuclear powered submarines with ballistic rockets

USSR

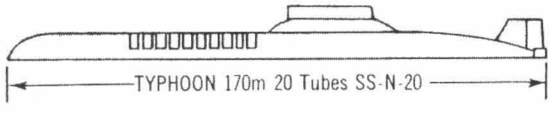
YANKEE-Class



DELTA-Class

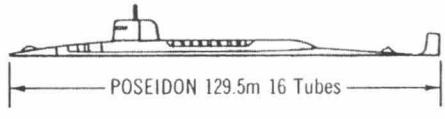


TYPHOON-Class

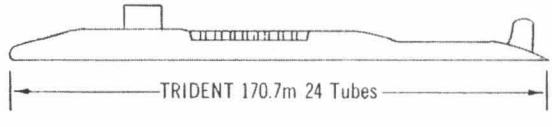


US

POSEIDON SSBN

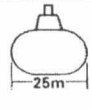


TRIDENT (OHIO-Class) SSBN

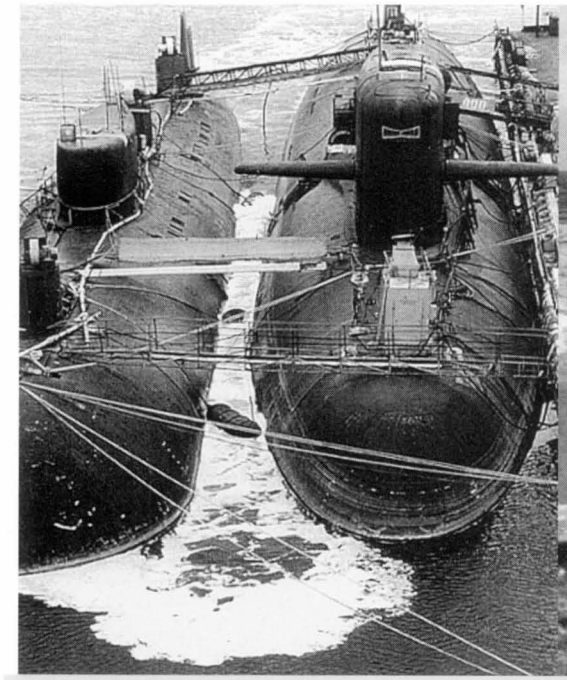


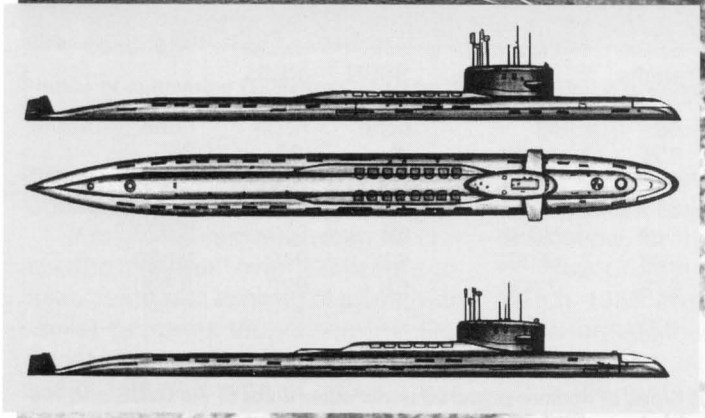
Tube = rocket shaft(s)
SSBN cross sections for comparison

TYPHOON Class

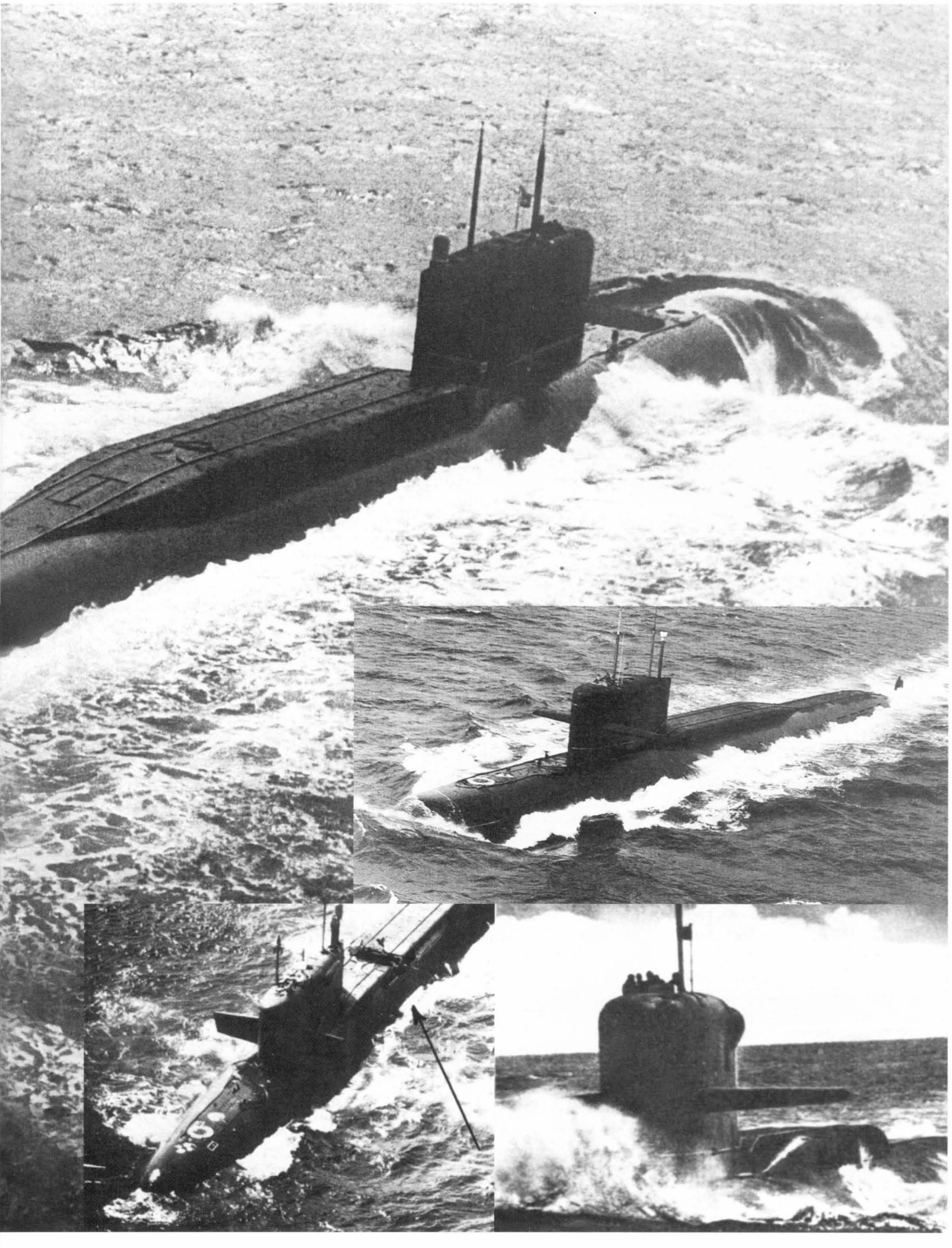


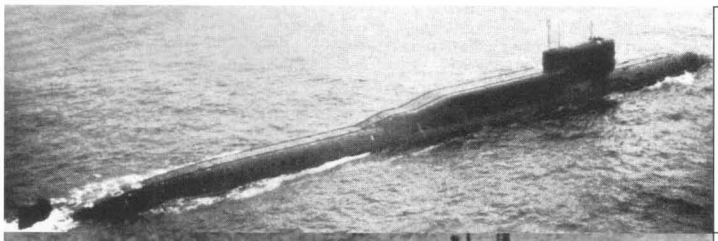
OHIO Class

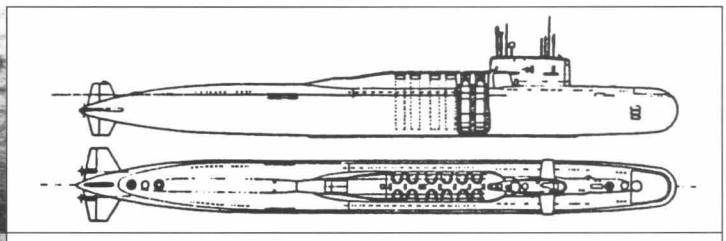


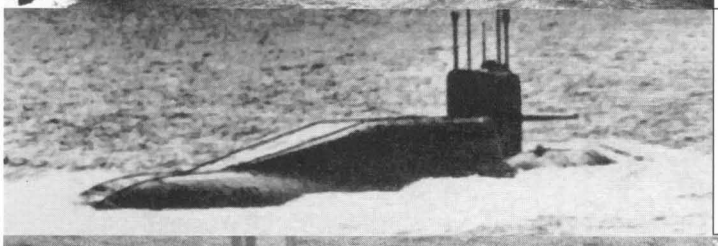


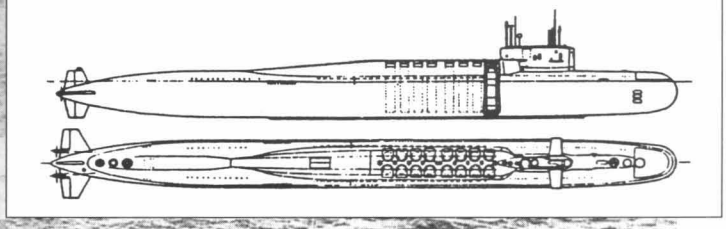
The 34 units of Project 667 (24 Navaga from Severodvinsk shipyards, 10 Nalim from Komsomolsk) of the Yankee I type were armed with 16 RSM-25 rockets. For tests with the SS-N-17 rocket with 12 tubes, one Project 667A Yankee II unit was made. Numerous Project 667 boats were rebuilt and modified. The picture (right) from October 1986 shows one unit shortly before submersion: the damage to the third pair of rocket shafts from the front can be seen clearly. NATO observers commented on the vertical front depth rudders, which probably were to temper the wind and protect the damaged area somewhat.

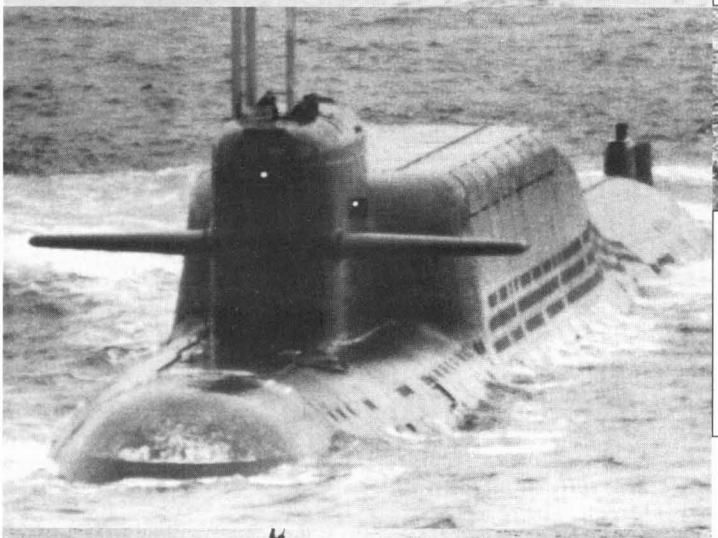


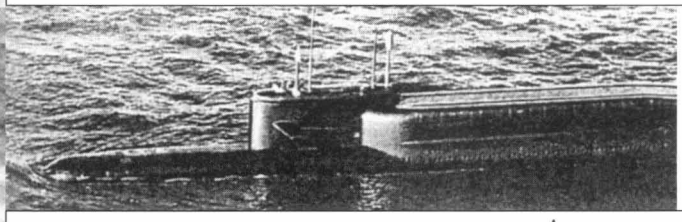


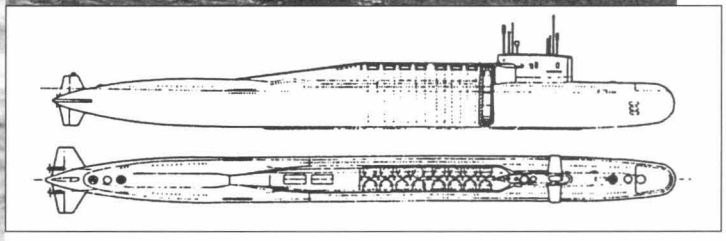




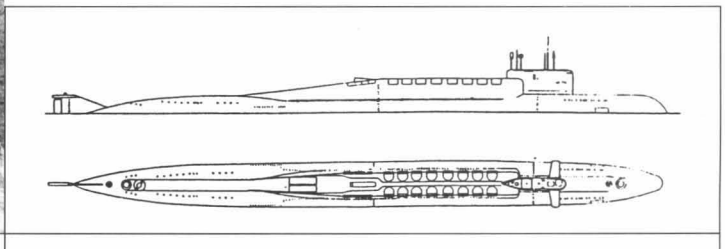


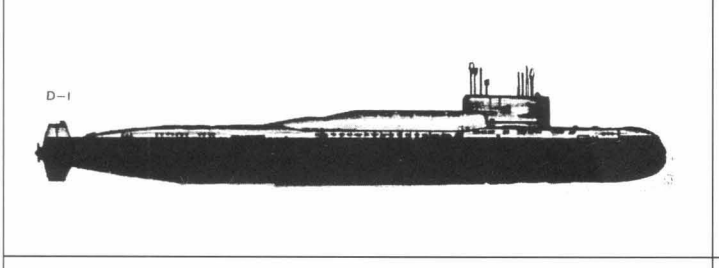


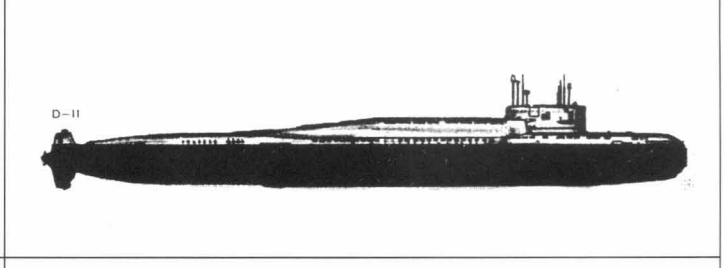


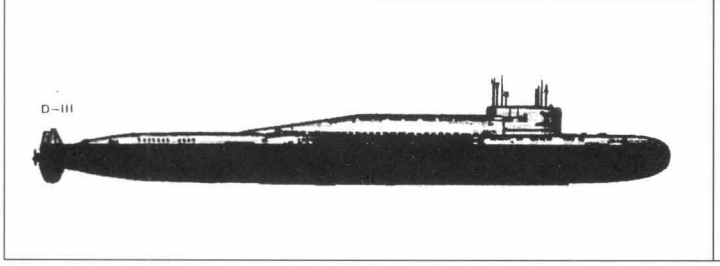


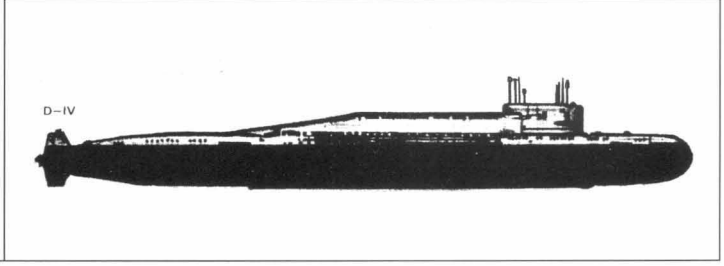
The units of Project 667B Murena/DELTA I (12 RSM-40/SS-N-8 rockets), 667BM Murena M/DELTA II (16 SS-N-8 rockets), 667BDR Kalmar/DELTA III (16 RSM-50 rockets, Complex 9-R/SSN-18, only on DELTA III; the first Soviet ballistic submarine rockets with several independently guided re-entry bodies—radius of targeting accuracy 1,100 meters) and 667BDRM Delfin/DELTA IV (16 RSM-54, Complex 9-RM/SS-N-23) belong to the large strategic submarines of the third generation. All the versions have a two-screw drive, as well as stabilizing fins (depth rudders) on both sides of the tower. From the top down: DELTA I to DELTA IV.

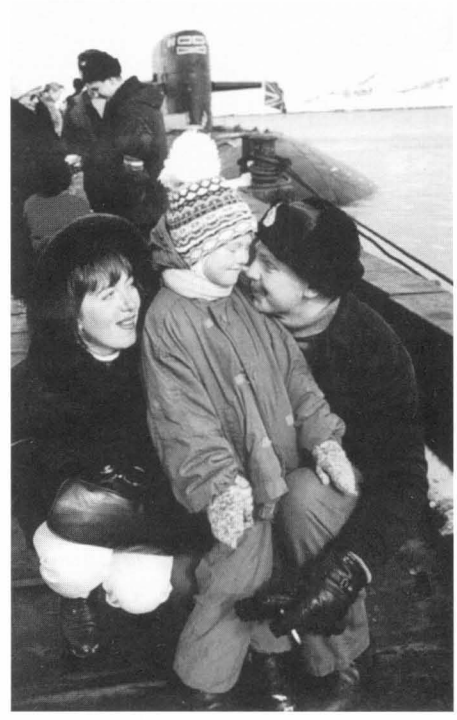












This, too, exists in Russia today: PR photos of the return of a Delta-class submarine.

project. Among the changes subsequently made was, above all, the elimination of the T-15 weapon. As experts saw it, it promised little success, what with the state of modern submarine defenses, to surface some 40 km off a coast, orient one's self according to the specified points, and then launch the giant torpedo. The project, worked over in the course of one year, envisioned in its place eight bow tubes for 533 mm torpedos to be fired only at depths of some 100 meters (20 to be carried). Thus, the tactical purpose had changed from attacks on coasts to surface aiming at sea.

Numerous innovations in Soviet submarine building for the future type—this applied above all to the crew's working and living conditions—were tested in a 50-day voyage aboard a rebuilt Type D submarine. Further boats of Project 611/ZULU and 603 WHISKEY served to test the newly developed navigation, observation, and communication equipment. All nine compartments of the new double-hull boat were examined as life-size dummies.

Even before all the projection work was finished, the building of the Project 627 submarine began in Shipyard 402 in June 1954. Parallel to this, the reactors were produced and tested at Obninsk; they reached the calculated parameters in the spring of 1956.

Here are further dates in the project:

9/15/1955: Keel-laying of Project 627 experimental boat, factory number 254.

In the next month a government decision approved the series production of Type 627A, the version reworked on the basis of experience with Project 627.

8/9/1957: Launching.

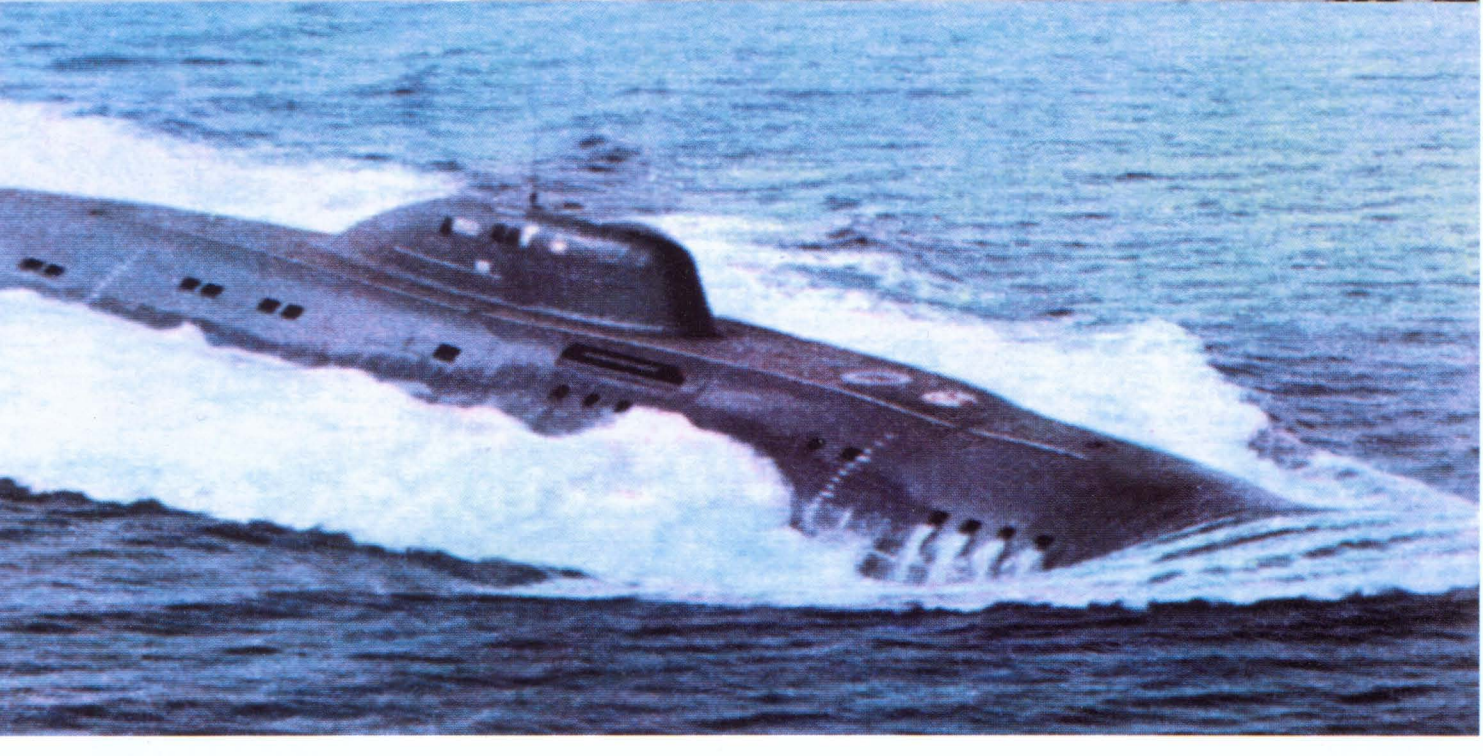
5/19/1959: Minister Ustinov, along with Naval Chief Gorshkov and other dignitaries, started the reactor of the atomic submarine.

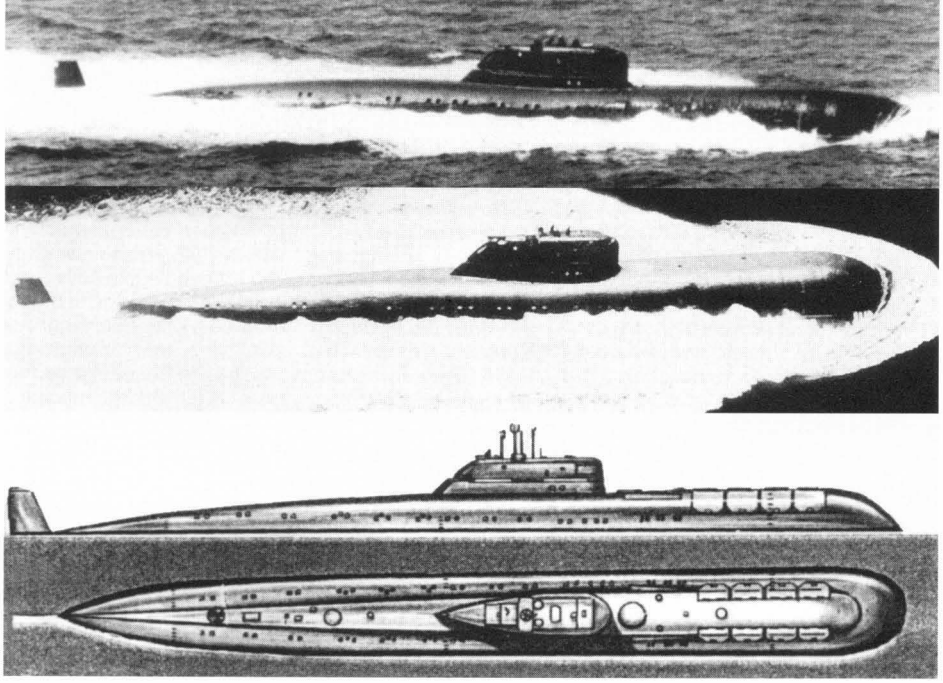
7/3/1958: The boat first left the harbor. With its performance limited to 60% for safety's sake, it reached 23.3 knots (calculated: 20.3 knots).

12/30/1958: The fleet accepted the boat at its test center. In five voyages during one month, 2,940 nautical miles were covered on the surface and 860 miles under water. The depth, in-

For a conversion flight under German participation (modified sea-supported WOLNYA/RSM-50/SS-N-18 strategic rockets with 80-centimeter long TCM module and WKK return capsule), a DELTA III unit was prepared in 1995. On July 7, 1998, at 5:15 Central European Time, a submerged DELTA IV vessel launched an RSM-54 Stihl-1N/SS-N-23 with a civilian payload for the first time. It consisted of two 32 x 32 cm research sattelites from the Technical University of Berlin for mobile communication. After fifteen minutes they were in orbit, and after fifteen hours they could be separated successfully. The photos (Kopenhagen: Bildschirm ZDF, now a journal) show the event.

VICTOR II Type unit.





Pictures taken from a U.S. Navy reconnaissance craft in the South China Sea in April 1974 show a Charlie-type (Project 670A Skat). On each side of the tower are eight launching shafts for Ametist rockets (Pr. 670M Skat-M/Charlie II: Malachit/Wulkan rockets, Project 06704 Chaika B/Charlie III; Onyx rockets since 1994).

creased step by step in 29 diving maneuvers, reached the Soviet record depth of 310 meters.

All during testing, numerous problems appeared, which led to many changes, the replacement of entire systems and various materials, as well as the complete powerplants. All this experience naturally was incorporated into the ongoing series production of Project 627A, the type of craft which had already had its keel laid in August 1956, with works number 260 and tactical designation K-5. In all, 12 Project 627A boats left Shipyard No. 402 from 1959 to 1964.

The World's Greatest Atomic Submarines - Strategic Underwater Giants

The first details of a fully new, gigantic underwater cruiser—as it has since become known—came out during a meeting of Communist Party Secretary Leonid Brezhnev and U.S. President Gerald Ford on problems of the SALT II agreement. Brezhnev spoke polemically on the subject in his speech to the 26th Soviet Union Communist Party (February 1981), explaining: "We have suggested that the creation of the Trident maritime rocket system in the USA and our corresponding system be banned. This suggestion was not accepted. As a result of this, the new submarine *Ohio* was developed with Trident rockets. An analog system, Taifun, was developed in this country."

Experts regarded it as unique that the USSR informed the worldwide public of a new weapon system even before its introduction into the armed forces.

In fact, the first vessel of the type called Typhoon by Brezhnev was put into service by the North Fleet on December 12, 1981, (it also received the other five vessels of this series). On March 3, 1977, its keel had been laid at Hall No. 3 in Severovodvinsk, and it had been launched on September 23, 1980. The official Soviet designation for the type was Project 941, the name for the type vessel was Akula (not to be confused with the pursuit submarines of the Akula class!). The NATO designation for this type was Typhoon.

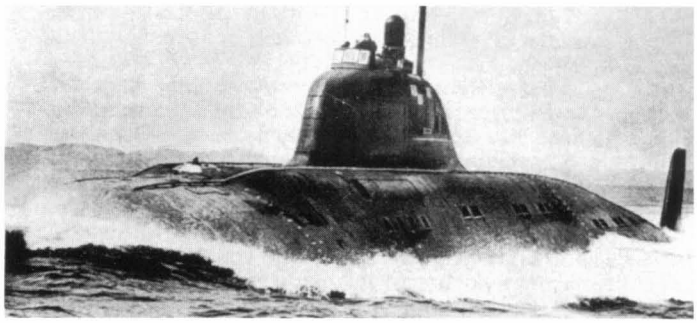
Insiders can report that the development of this, the world's largest underwater vessel (displacement 23,200/48,000 tons; U.S. Ohio type: 16,000/18,750 tons), and its rockets are the counterparts of the U.S. submarines with Poseidon and Polaris rockets.

After the first dates for these weapons were made known, the task of designing a corresponding Soviet type would have been assigned to the design bureau of Makeyev and Kovalyov through the channels via Brezhnev, Ustinov (Armament Minister), Grechko (Defense Minister), Afanasyev, Butoma, and Gorshkov (Navy Chief). It was supposed to be able to operate under the polar icecap, and to launch rockets in salvos "from its own zone of operation"—practically on its own.

Even in purely external terms, the type developed according to these and surely many other requirements shows differences from most other underwater rocket carriers: The shafts for twenty ballistic rockets, set up in a double row, are found in the long bow. The long, high tower, angling off to the rear, is located aft. Its wider substructure, dropping at an angle on all sides, has a streamlined design. The wide, squat hull, consisting of three pressurized sections (length 171.5 meters, width 24.6 meters, height without tower 13 meters) with two bilge-keels on the outside guarantees surface stability. As in the improved atomic submarines of the Los Angeles Class (USA, 688 tons), the Typhoon craft also have folding depth rudders on both sides of the forward hull. Thus, damages are to be kept to a minimum and breaking through ice sheets up to three meters thick is to be made easier (the polar icecap has to be broken through to launch rockets). The particular arctic conditions (ice pressure) also account for the housing of the two propellers in ducts with a diameter of some 5.5 meters.

The most modern navigational, satellite communications, and weapon-control systems are among its equipment.

A word now about the rocket-launching procedure. According to information from Russian specialists, two special keys are necessary; they are kept in the possession of the commander and the SLBM sector leader (formerly the political representative). Along with these special keys, the coded launch signal from the known atomic case of the Russian president (formerly the Secretary-general of the Communist Party) has to be available. Then the received launch signal is compared with the one in the weapons computer, so as to allow all further operations to start. The actual flight program of the rocket to determined targets is stored on a punch-coded strip (normally in the commander's safe) for the ship's EDV complex. For launching, the commander must supply a series of codes known only to him and checked by the weapons computer. Finally, the computer determines the



At the end of the seventies, this photo (left) appeared in the media, which gave the name of the atomic submarine as "50th Anniversary of the USSR." This designation had been given to K-323 (Project 671 Jersh/Victor).

After that, photos of craft of all Victor versions appeared repeatedly without precise details (upper right, Victor III with addition aft for drag sonar; below, Victor II).

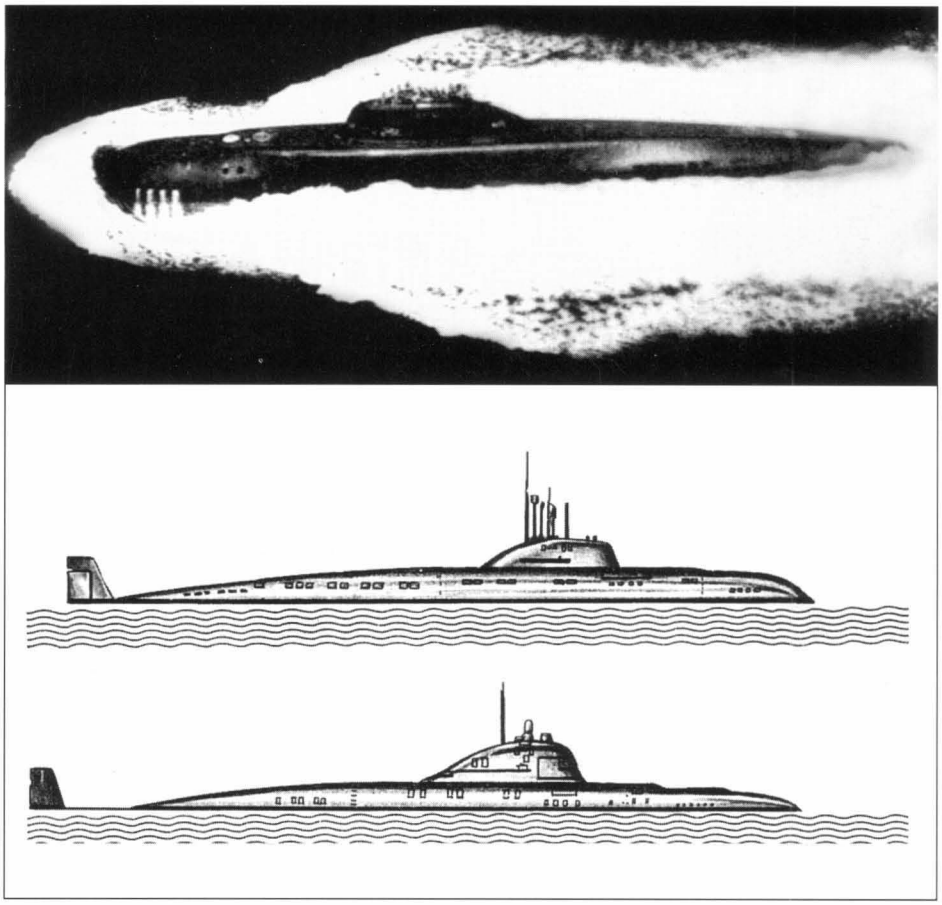
rocket's course to a specific target by once again comparing the ship's location with the target coordinates. Launching a salvo of rockets can be done within fifteen seconds. The targeting radius is stated as 500 meters.

The working and living conditions for the two 75-man crews (55 of each being officers) pass for luxurious as Soviet conditions go. The cabins for two or four officers are furnished with wooden bunks, desks, shelves, cupboards, television, wash-stands, and air conditioning.

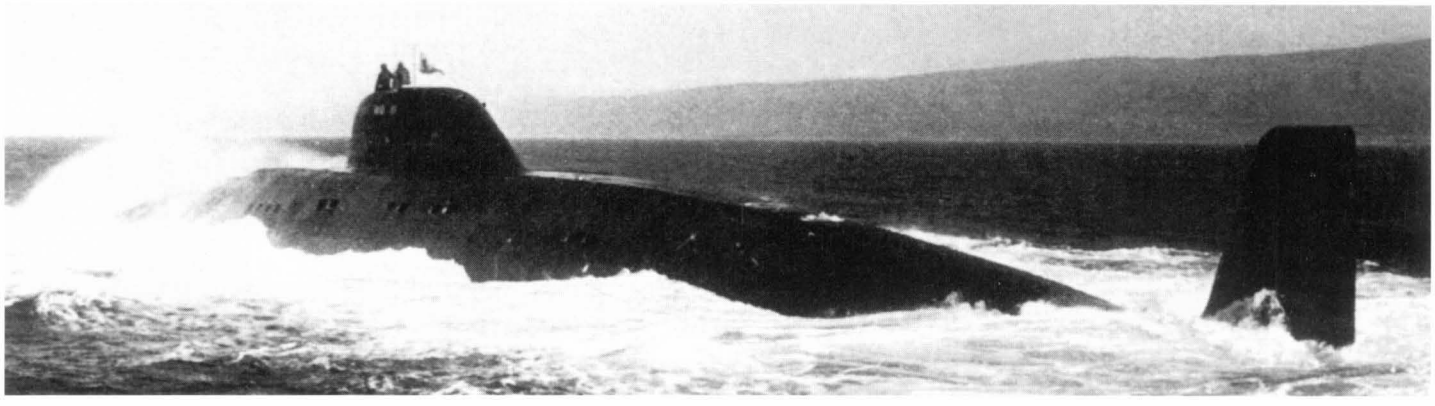
The quarters of the other crew members were to be scarcely less comfortable, and along with showers and saunas with a swimming pool, there are even said to have been a small bird enclosure and a greenhouse.

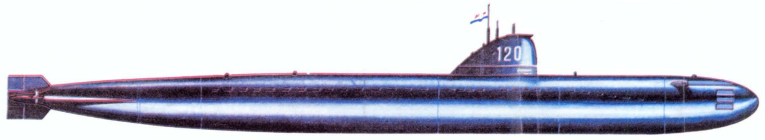
All six boats went to the North Sea Fleet and were based at Litza Gora. The building of the seventh unit was halted.

The crews of the submarines of this series also had (and surely still have) to deal with a series of minor accidents. It has become known that a practice rocket was launched, in spite of the cancellation of the order to fire, during training in the White Sea on September 27, 1991. Boat TK-17 had a fire on board after the explosion of a compressor on its way to Severomorsk late in May 1992, leaving one man dead and five injured. In mid-1995 a Project 941 boat fired a rocket unintentionally near the North Pole.



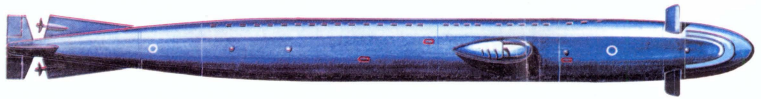
As *Jane's Fighting Ships* reported in its 1996-97 edition, only two boats of this type were ready for action at that time, while the modernization of the two berthed at Severovodvinsk was very delayed for financial reasons.

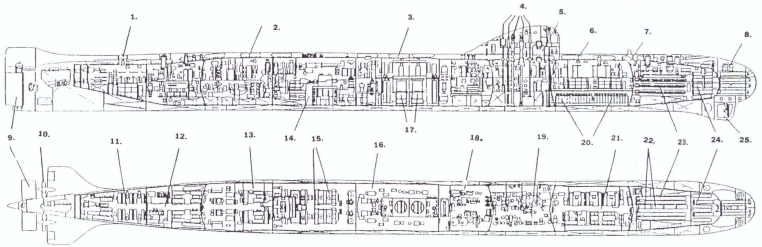




The first Soviet atomic submarine (Project 627 K-3) (cutaway drawing from Neue Berliner Illustrierte)

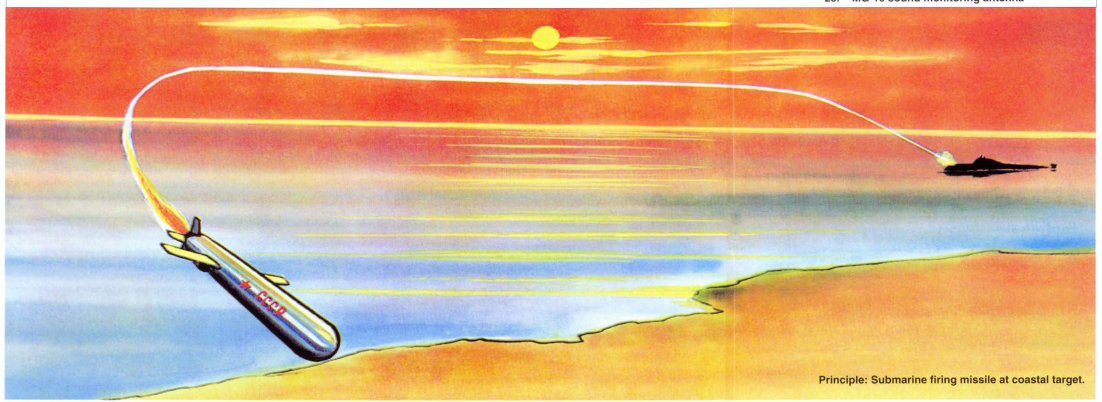
Atomic Submarine "Komsomolez," USSR.





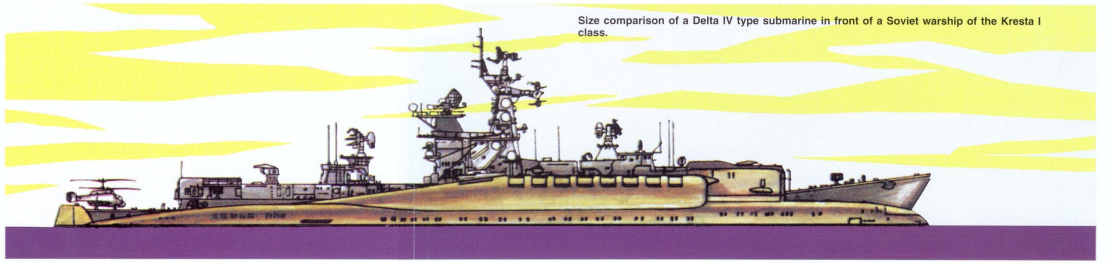
Cutaway drawing of Project 627A atomic submarine

1. Emergency evacuation hatch, 2,3,6. compressed air containers, 4. Periscope, radar and radio antennas, 5,19. Command center
7. Hatch for loading torpedos
8. Antenna for "Arktika-M" sonar
9. Vertical and horizontal rudders
10. Screw propellers
11. Rudder drive, 12. VIII living quarters
13. VII engine room
14. VI turbine room
15. V turbine generator room
16. Power supply room
17. Nuclear reactors
18. Diesel-electric motors
20, 21. Battery room
22. Crew quarters, I torpedo room
23. Spare torpedos
24. 533 mm torpedo tubes
25. MG-10 sound monitoring antenna



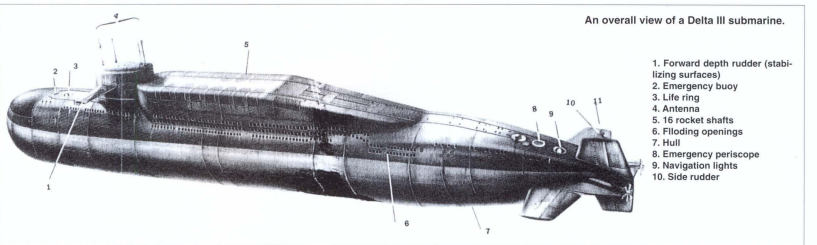
Principle: Submarine firing missile at coastal target.

A Delta III unit beside the large supply ship *Ivan Rogov*.



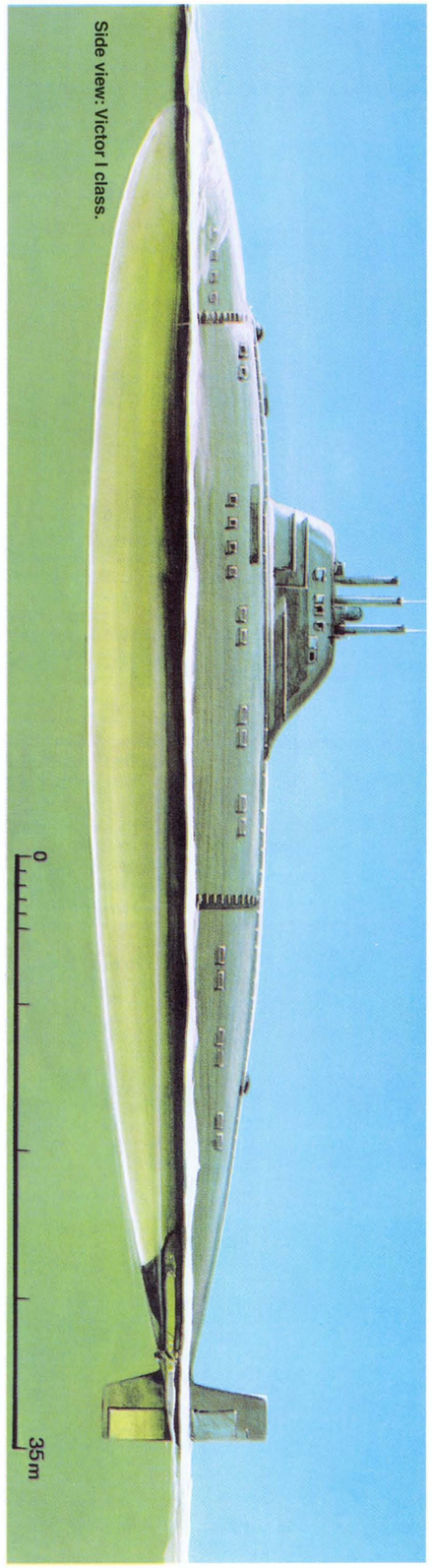
Size comparison of a Delta IV type submarine in front of a Soviet warship of the Kresta I class.

(Insignia) The dolphin decorates the emblem of the submarines—as a symbol of power and of the sea dwellers.



An overall view of a Delta III submarine.

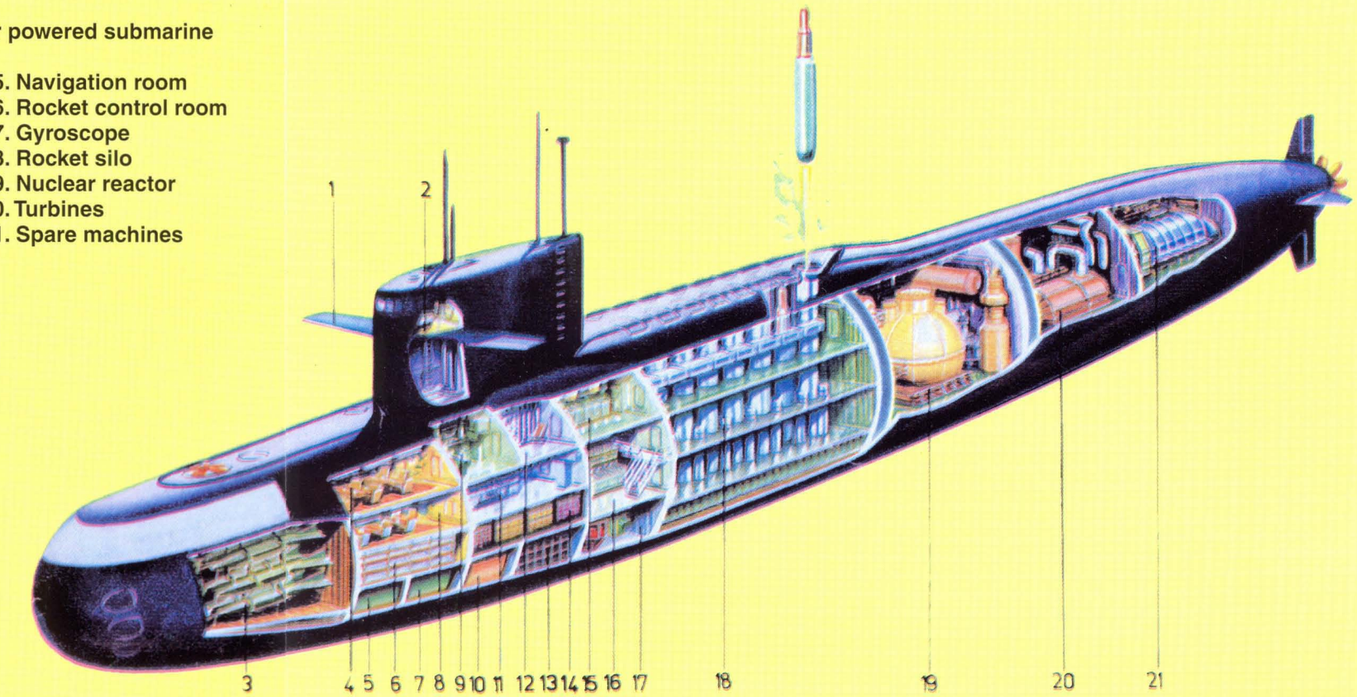
1. Forward depth rudder (stabilizing surfaces)
2. Emergency buoy
3. Life ring
4. Antenna
5. 16 rocket shafts
6. Flooding openings
7. Hull
8. Emergency periscope
9. Navigation lights
10. Side rudder



Side view: Victor I class.

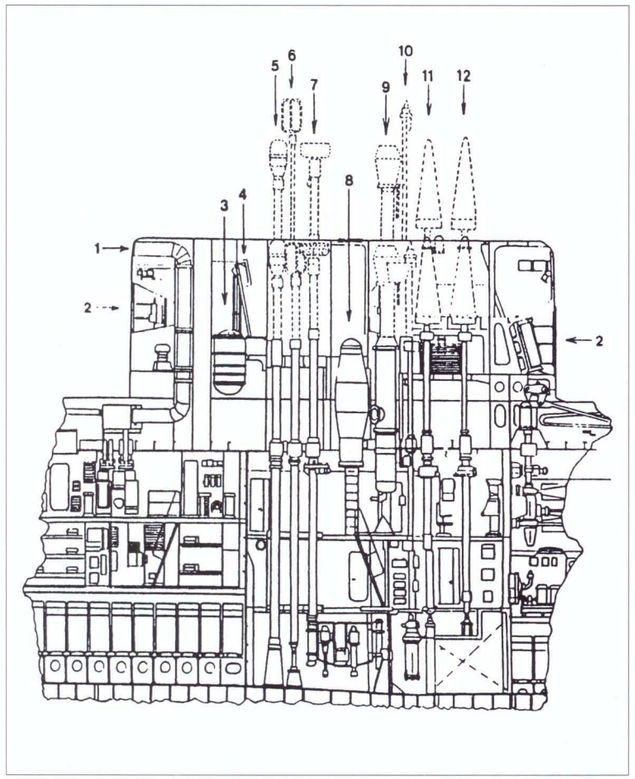
Cutaway drawing of a nuclear powered submarine

1. Stabilizing surfaces
2. Bridge
3. Torpedo room
4. Officers' mess
5. Ballast tank
6. Enlisted men's quarters
7. Trimming tank
8. Enlisted men's mess
9. Control room
10. Tank
11. Rocket control
12. Periscope room
13. Batteries
14. Supplies
15. Navigation room
16. Rocket control room
17. Gyroscope
18. Rocket silo
19. Nuclear reactor
20. Turbines
21. Spare machines



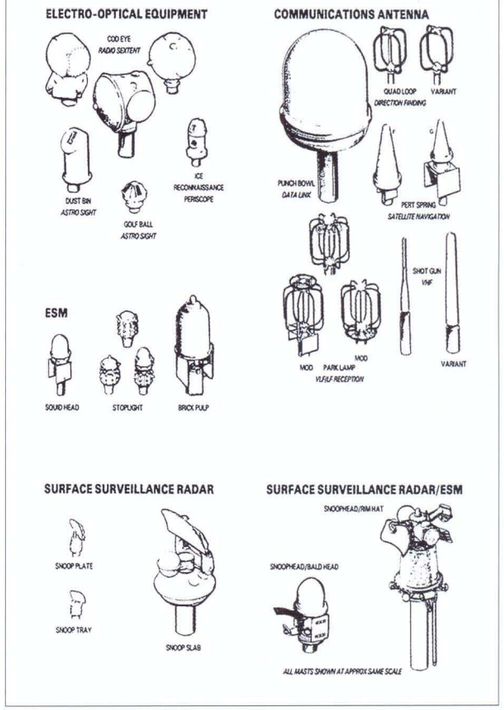
This drawing approximates the Project 667 Navaga/Yankee I, though that type had two propellers (from Armeerundschau Magazine for the Soldier, Berlin).

An artist's impression of a surface launch from a Delta III submarine.

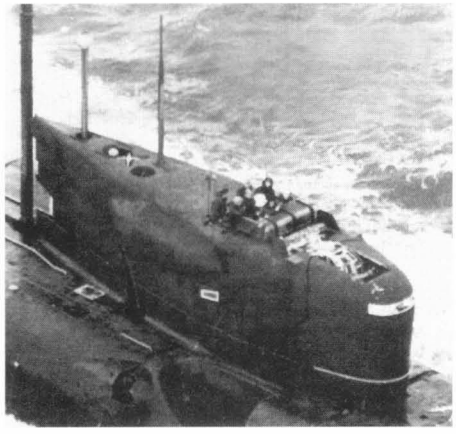


Cutaway drawing of a tower structure (From International Defense Review).

SOVIET SUBMARINE MASTS



The atomic submarines of Project 675/675M Echo II carried eight P-6/SS-N-3a winged rockets on board for surface launching.



This photo of the tower makes the position of the tracking radar at the front clear.

In spite of that, it was said that Russia's naval leadership wants to keep the Project 941 underwater vessels active into the next century—though with only six explosive warheads per rocket instead of the present ten. After that the Typhoon class, along with the seven Project 667 BRDM/Delta IV boats and the eleven boats of Project 667 BDR/Delta III, will make up the maritime components of the Russian nuclear forces after 2003. From governmental and military offices there has come information that as of about 2010 a new atomic submarine armed with ballistic rockets could be added to the fleet.

The Shipyards

Northern Machine Construction of Severovodvinsk (SMB-Yard 402, also called Shipyard No. 402 in the literature):

This designation was given to the shipyard in the mid-sixties, when the Soviet submarines became the main weapon of their naval fleet. The shipyard remains to this day the base and center of Russian state atomic shipbuilding.

The place was founded on the delta of the northern Dvina river (some 30 km west of Archangel) in 1750. When the shipyard was begun in 1930, the city was called Molotovsk. In 1957 it was renamed Severovodvinsk. Some 12,000 political and criminal prisoners took part in the work under the worst conditions (bad treatment, climate, permafrost), so that the yard could begin production in 1938. The works, planned for 35,000 to 40,000 workers, is now one of Russia's largest shipyards.

A reinforced concrete structure over the main dock, which is 310 meters long and 139 meters wide, assures all-year production. The main dock, known officially as Hall 50 (maximum security zone!), should allow the simultaneous construction of two battleships of the planned Sovietski Soyuz class. Among the ships built in Severovodvinsk are: the battleship *Sovietskaya Belarussia* (keel laid November 1939, not finished), and after 1945 three destroyers of the Ognevoy type (Project 30), 18 Skory type destroyers (Project 30b), and two Sverdlov type cruisers (Project 68b).

Submarine construction began shortly before the war, with the L-20 and L-22. From 1952 on, the most important Soviet submarine types were built there. These included the November, Hotel, Yankee, and Delta types (all built in Hall No. 1).

The strategic Yankee and Delta submarine types were built from 1967 on in collaboration with the yards on the Amur in Komsomolsk. In Severovodvinsk, three fully separable and heatable halls were available:

Hall No. 1 was reserved for building boats of the Typhoon and Oscar classes, while Hall No. 2, fitted with a special course of rollers, produced submarines whose special technological requirements (such as titanium hulls) had to be met.

Since 1994, the yards gave the boats of the Typhoon class (always two at a time) a series of modernizations, particularly in terms of electronics, as well as preparation for the RSM 54 (SCHTIHL) rocket system. The available and prepared materials for the seventh boat were used up and work was halted shortly after the keel was laid (because of START II negotiations and economic difficulties).

According to inside information, the yards were occupied after the completion of the Typhoon and Delta series with sub-chasing submarines of the Akula class, as well as the Oscar class (missile vessels).

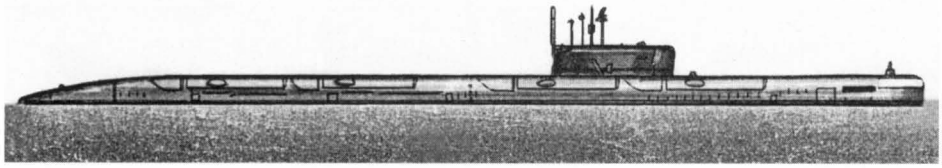
According to determinations of the Start II agreement, atomic submarines of the Yankee and Delta classes were also taken out of service, whereby—as also elsewhere in Russia—there have been major problems with their radioactive waste.

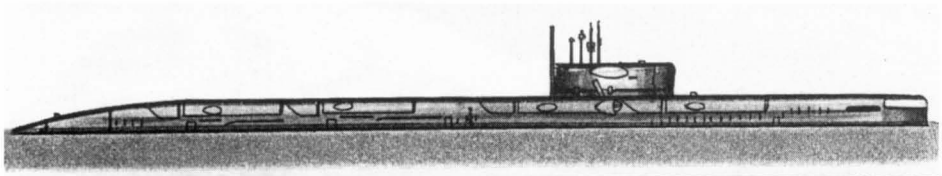
Building new submarines at the Severovodvinsk class is questionable, on account of the overall financial situation.

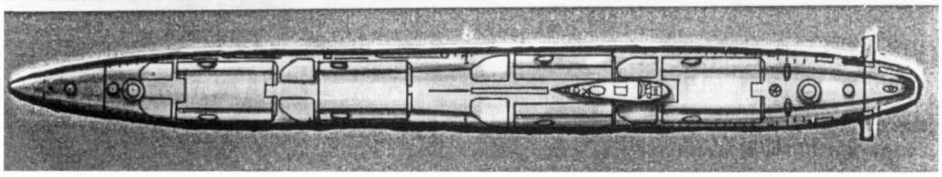
For some years this splendidly equipped shipyard has worked on civilian projects in order to remain in existence.

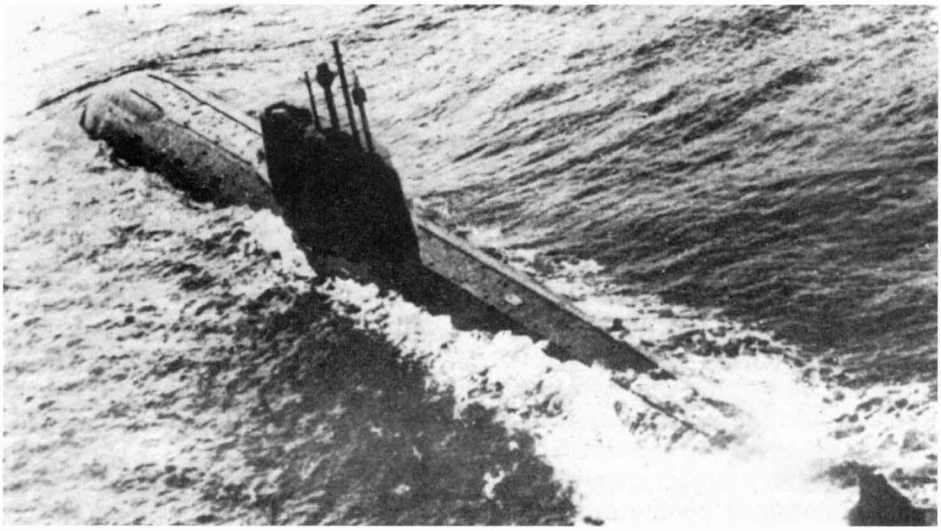
Shipbuilding Works No. 199 "Leninsky Komsomol," Komsomolsk on the Amur, renamed "Amurski Shipbuilding Works" in 1991.

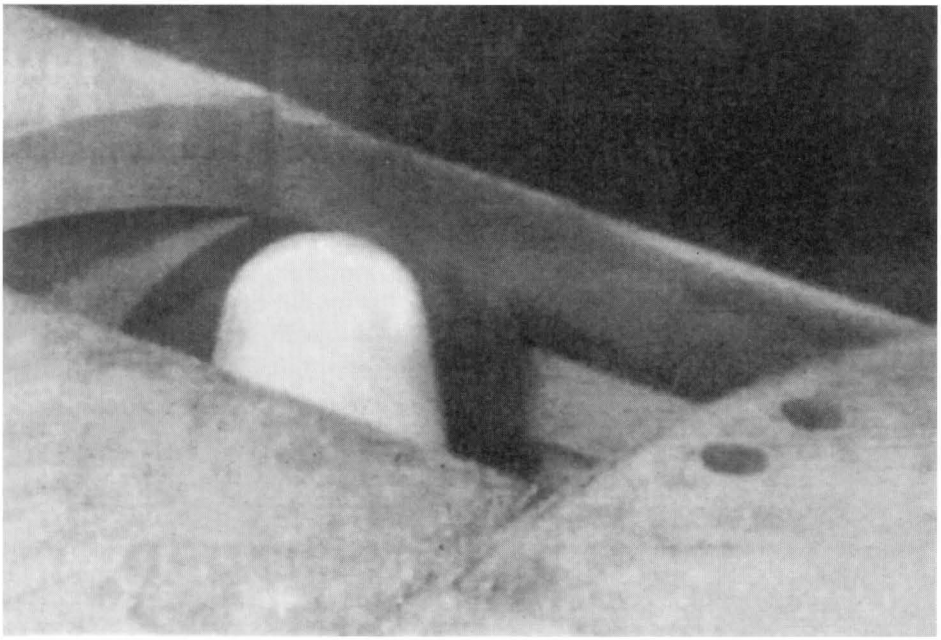
Along with Works 199 and 402, at the end of the sixties, with the advent of











The only Project 685 Plavnik/Mike atomic submarine (tactical number K-278 Komsomoletz) had its keel laid on April 22, 1978, was launched on June 3, 1983, and put into service on October 20, 1983. Equipped with regular and nuclear torpedos (photo) and built with a titanium hull, it was lost in the Norwegian Sea on April 7, 1989. TASS and the East German press were notified of its loss and the loss of its 42-man crew.

the extensive atomic submarine series, the large shipyards in Leningrad (No. 194 "Admiralty Yards" and 196 "New Admiralty Yards," later the Leningrad Admiralty Union, today the "Admiralty Yardsa" of St. Petersburg) and Gorki (No. 112) took part in the construction program.

Shipbuilding Works No. 202, Vladivostok
Shipbuilding Works No. 892, Bolshoi Kamen (some 40 km east of Vladivostok), today the "Zvezda" Works.

Shipbuilding Works No. 893, Severovodvinsk, today the "Zvezdochka" Works.
This facility equipped an existing Project 629 submarine with six shafts for the R-29 rocket complex in 1976, converting it to Project 601/Golf III specifications.

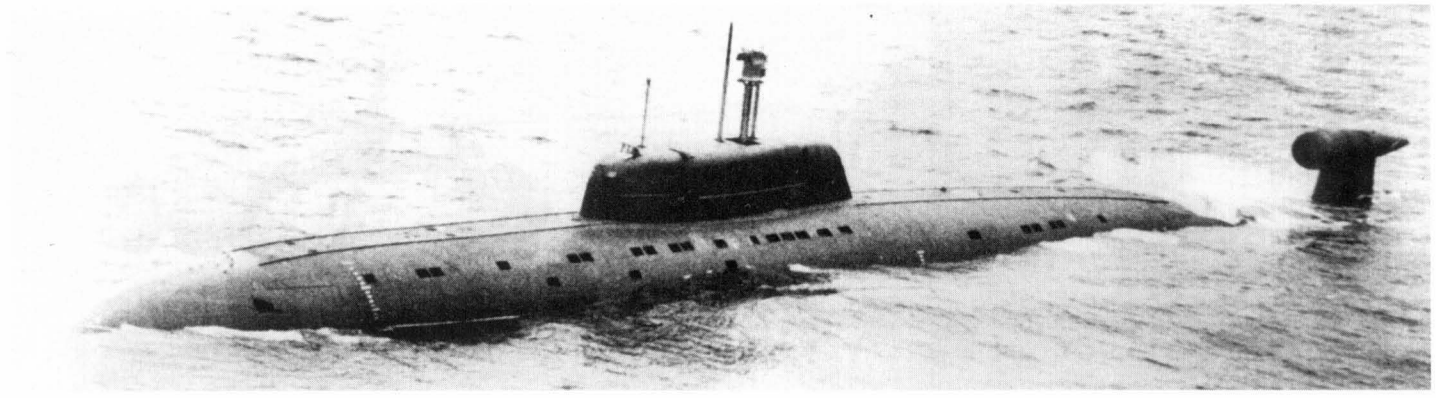
All the works participating in modernizing the "Zvezda" and "Zvezdochka" submarines, as well as the new "Nerpa" works (at Snesnogorsk, south of Norilsk), had the tasks of building, modernizing, and reequipping atomic submarines.

"Krasnoye Sormovo" Works at Gorki (since 1991 again Nizhni Novgorod, Works No. 112)
With the end of the developmentak program for missiles in the mid-sixties, the capacities of Works 199 and 402 were fully occupied with building strategic underwater rockets. For that reason the works in Gorki were given most of the work on missile-carrying submarines.

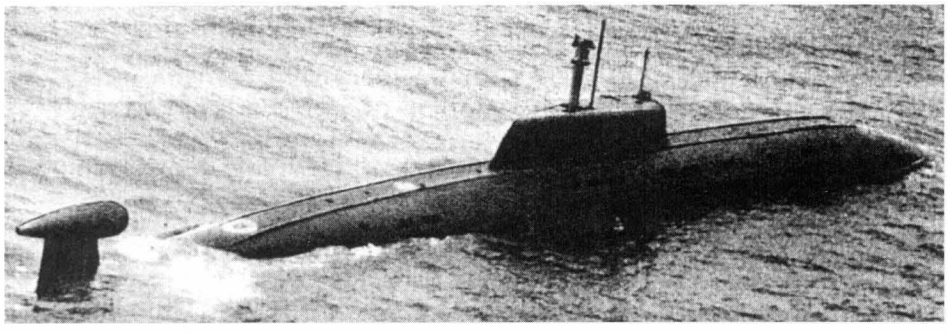
Works No. 189, Leningrad
Responsible for building and reequipping numerous submarines. Other shipbuilding firms, such as "Sevmorzavod" (Sevastopol, Crimea) and "Dalzavod" of Vladivostok, have likewise been called upon for repair work.

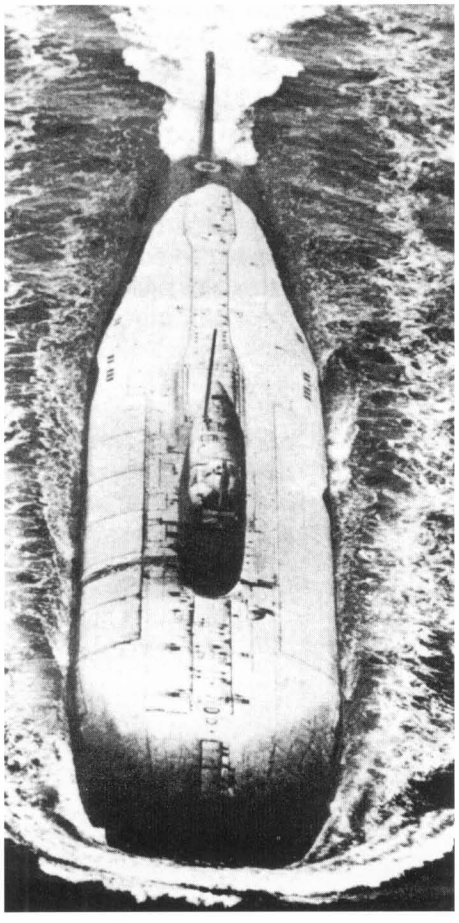
Research Facilities, Design Bureaus, Suppliers
The designations in parentheses were introduced in 1966.

"Arsenal" Design Bureau, Leningrad
This facility was formed in 1949 for the design and development of anti-aircraft weapons for the Navy. It had extensive experience in the area of solid and mixed fuels for rockets. In the mid-sixties it created the D-6 solid-fuel rocket complex, followed by a similar complex for medium-range rockets (in three



In 1984 (K-276 KRAB) and 1987 (K-239 KARP), the Project 945 Barracuda/Sierra I and K-276 KRAB joined the fleet. K-276 collided with an American submarine in Russian waters on February 11, 1992, and was repaired at the Zvezdochka yards. The two Project 945A Condor/Sierra II K-534 Subatka boats are still in service. K-536 (Project 945B) was retired in 1997. The photos clearly show the towable sonar device mounted at the stern.





With the Project 949 Granite/Oscar I and 949A Antey/Oscar II units, the Granite/SS-N-19 Shipwreck missile joined the fleet's armament.

steps as 8K98 with varying shafts, in two steps as 8K96 with mobile launching silos).

NII-8 Research Institute, Obninsk
Founded to build the submarine reactor for Project 627, it was also responsible for all related areas (active zone, guiding and protection systems, biological protection).

Numerous other institutions collaborated (work documentation: Testing Design Bureau OKBM of Gorki/Nishni Novgorod; steam generator cooperation: Leningrad Boiler Building Institute; Developing the pumps for the primary circuit and turbine units by a team from the Kirov Works in Leningrad).

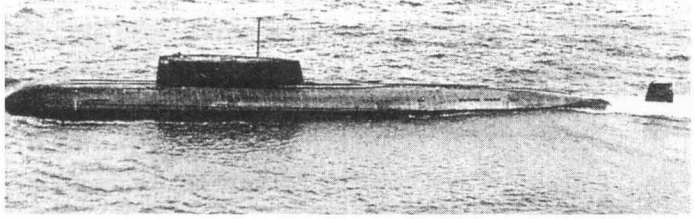
NII Chim Masch
Scientific research institute for chemical machine building NIMIST—scientific research institute of the sea battle fleet for long-range communications; along with the Institute for Radio Technology and Electronics, as well as other facilities, it supplied the submarine fleet with its required communications equipment. It carried out numerous experiments for this purpose and for the design of appropriate ground facilities (antennas, etc.).

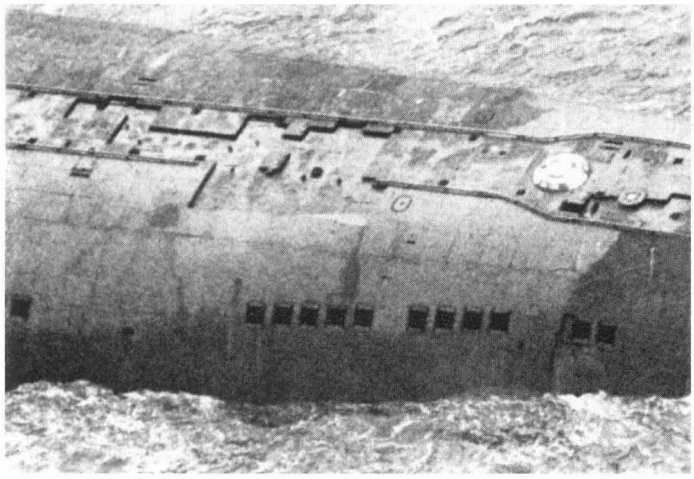
OKB-1 Experimental Design Bureau, Moscow-Podlipki
This institution for the construction of ballistic missiles was first directed by Sergei Korolyov. From 1955 on, it also worked on the special D-2 submarine rocket complex. It took over the work of Special Design Bureau 385, founded for that purpose in Miass in the Urals, and led by Vladimir Makeyev.

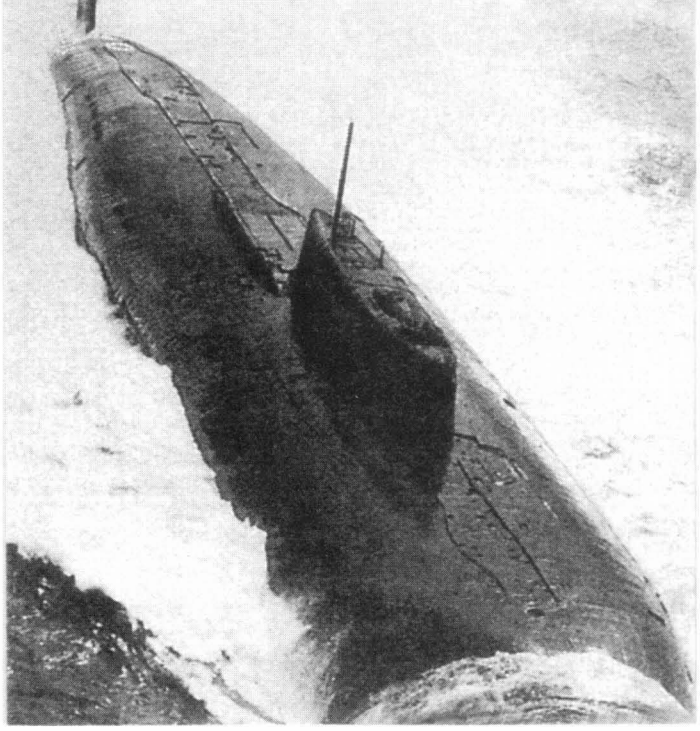
OKB-49 Experimental Design Bureau, Taganrog
This institution was directed by Georgi M. Beriyev (2/13/1903-1979), designer of numerous naval aircraft types. It developed the P-10 submarine missile and tested on a Project 611 submarine, but was not put into service.

OKB-52 Experimental Design Bureau, Reutov (eastern edge of Moscow), also called the OKB of the State Committee for Aircraft Technology
This institution, under the direction of Vladimir N. Chelomei (1914-1984), designed pulse jet powerplants up to 1945, and then developed several types of winged rockets, including the P-5 and its modernized P-5D version, as well as the supersonic P-6 missile for submarines (of the numerous winged rocket developments, only the P-5 and P-6 complexes were taken over by the fleet).

From the end of the fifties on, missiles suitable for underwater launching (otherwise for fast uncamouflaging of submarines) were developed. In collaboration with other firms and bureaus, the "Amethyst" type came into being; it was tested in 1964-66 on adapted Diesel-electric submarines of Projects 613A and 613D/Whiskey, and put into service in 1967 to arm the Project 670/Charlie I and 661/Papa atomic submarines.







SKB-16—Special Design Bureau, Leningrad (also found in the literature as ZKB-16 - central design bureau; ZPB "Volna")
It was responsible for the development and building of launching devices for ballistic missiles on submarines.

As of 1957 it developed Project 661/Papa as a missile carrier.

From 1963 to 1972, it equipped 13 Project 629A submarines with the D-4 rocket complex.

In 1963, Pre-project 701 led to Project 701/Hotel with six R-29 rockets.

SKB-112 - Special Research Institute (SKB "Sudoproject," renamed ZKB "Lazurit" in 1974)
In 1958 it did the developmental work for the Project 665 submarine, equipped with four P-5 winged rockets.

From 1957 on, it developed the Project 670/Charlie I atomic submarine, later modified to carry missiles.

SKB-143 - Special Research Bureau, Leningrad-St. Petersburg (SPMBM)
Under a government contract, it developed the first Soviet atomic submarine, being fully reorganized and very much expanded for this task in 1943.

It was responsible for the Type 627A, PT-627A basic submarine project.

It developed the atomic submarine Project 653 for two P-20 winged rockets (intended for use against important strategic targets in the enemy's hinterlands) by aircraft designer Sergei W. Ilyushin (3/18/1894-2/10/1977). The work was halted in February 1960.

ZKB-18 - Central Design Bureau (LPMB "Ruby")
From the early forties on, it was responsible for directing the organization of Soviet submarine design.

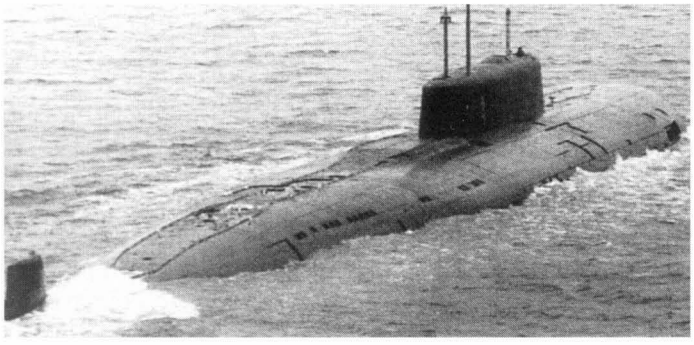
In 1950, project studies for the adoption of winged rockets for submarines were begun (after experience with copies of the German V-1). The high point of this work was the equipping of various submarine types (until the atomic Projects 659 and 675) with P-5/SSN-3C winged rockets and their P-5D and P-6 further developments.

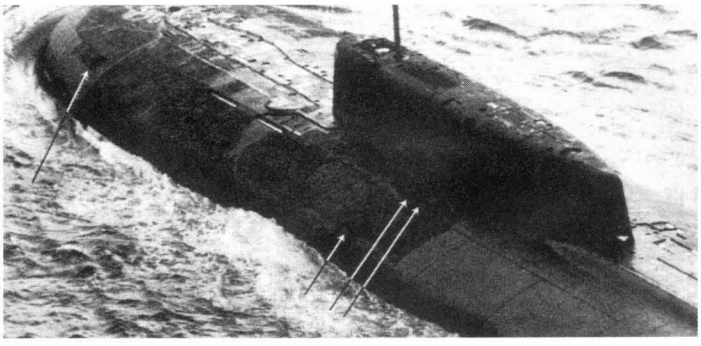
As of 1956 it worked on the arming of the future atomic submarines of Project 658/Hotel I with ballistic rockets.

From 1963 to 1972 (UM?) it equipped seven Project 658M submarines with the D-4 complex.

From 1965 on, it worked on Project 667B/Delta I with R-29 ballistic rockets of intercontinental range (Rocket Complex D-9) as a replacement model for Project 667A submarines.

ZNII-45 - Central Scientific Research Institute ("Krylov" Institute)
Testing hull shapes and powerplants of submarines, as well as their effect on sound sensors.





With the Peoject 949 Granite/Oscar I and 949A Antey/Oscar II units, the Granite/SS-N-19 Shipwreck missile was introduced. The 24 shafts are arranged on both sides of the tower. It was found again and again by NATO observers that parts of the protective layers, made of unusually thick ceramic plastic material (active sonar location), had been replaced.

Of the 16 units of Project 971/09710 Chtchuka B/AKULA, two (Gepard and Kuguar) are still under construction.

After that, it developed and tested hydroacoustic safety levels for hull surfaces, as well as ways to dampen powerplant vibration and increase shock safety and magnet protection (with less vulnerability to acoustic and magnetic torpedos and mines).

Along with ZNIIWK (Central Scientific Research institute for Warship Construction), it has researched means and methods of making atomic submarines acoustically undiscoverable while underwater (means of overcoming hydrophones installed in the [Schelf].

ZNII-48 - Central Scientific Research Institute, Leningrad (now NII "Granite," Saint Petersburg)

The Soviet Union's largest research center for shipbuilding.

It developed the newest, highly secure steel alloys for greater diving depths, such as Steel AK-25 for pressure hulls, Project 627.

For this it built departmental dummies and tested in its own proving grounds (explosion security, hydrostatic durability).

It developed acoustic measures (more quiet propellers, less audible and less locatable levels, sprung mounts for various machinery), handling qualities, and steerability.

The SPMBM and SKB "South Project" Design Bureaus were unified in 1974 to form SPMBM "Malachite."

An Outline of Soviet/Russian Submarine Construction since 1945

Organized by the Soviet principle without chronological order, these type designations for warships were used to indicate projects with numbers added.
In the literature, contradictions appear in terms of spelling, designations, dates, etc.
For the following list, new Russian sources have been used primarily (see bibliography).
They mean:

A	Atomic powerplant
D	Diesel powerplant
SSBN/SSB	Strategic rocket submarine
SSGN/SSB	March missile submarine
SSN	Fleet or attack submarine
SSF	Long-range submarine
SSM	Medium-range submarine
SSC	Short-range submarine
SSR	Radar submarine
ARSS	Rescue submarine

Meanings of abbreviations:

B	Baltic shipyard
KS/Go/NN	Krasnoye Sormovo/Gorki/Nishni Novgorod—used at different times for the same shipyard
LAO	Russian abbreviation: Leningrad Admiralty Organization
NA	Russian abbreviation: New Admiralty Shipyard
Sev.	Sevastopol Works
Su/Len.	Sudomex Works, Leningrad
196	No definite information; perhaps typographical error for 199
199/Ko	Works No. 199, Komsomolsk on the Amur
444	Works No. 444, Nikolaiev

(From the possible types of classification, the order of Soviet submarine classes commonly used in the West was chosen to add to type designations).

* dropped under the Start III Agreement
Number in parentheses: mustered-out units)

USSR Desig.	Fleet name	NATO Desig.	Type built	Power	Where built	Year	Number
601	-	Golf III	SSB	D	-	893 rebuilt from 12/69 on	
605	-	Golf IV	SSB	D	-	893 rebuilt 1971	
611	-	Zulu IV	SSF	D	196,402	1953-58	9/17
W-611,AW-611	-	Zulu V	SSB	D	402,202	1956-58	5/1
(rebuilt for R-11FM ballistic missiles)							
613	-	Whiskey	SSM	D	444,KS,B	1952-57	215
615/A615	-	Quebec	SSC	D	Len.	1953-62	29
617	-	Whale	-	D	Len.	1955	1
619	-	Golf V	SSB				
627	Kit	November	-	A	402	1959	1
627A	Kit	November	-	A	402	1959-63	12
629	-	Golf I	SSB	D	402,199	1959-62	15/7
629A	-	Golf II	SSB	D	402	1968	rebuilt D-4
629P	-	Golfmod	SSB	D	402		Rebuilt
633/633RW	-	Romeo	SSM	D	KS	1959-62	22
640	-	Whiskey					
		Canvas Bag	SSR	D			
641	-	Foxtrot	SSF	D	196,NA,LAO	1959-62	45
I641	-	Foxtrotmod		D			
641B SOM	-	Tango	SSF	D	Go	1974-81	19(10)
644	-	Whiskey Twin	Sev,KS			1960	3/3
		Cylinder	SSG	D			
645	Kit	November	-	A	402	1963	1
651	-	Juliet	SSG	D	KS,Balt	1963-68	14/2
658	-	Hotel I	SSBN	A	402	1960-64	8
658U, 658M	-	Hotel II	SSBN	A			
659/659T	-	Echo I	SSGN	A	199	1961-62	5
661	Antschar	Papa	SSGN	A	402	1969	1
665	-	Whiskey			Balt.	1958-60	6
		Long Bin	SSG	D			
667	Nawaga	Yankee	SSN	A	402	1967-72	24
667	Nalim	Yankee	SSN	A	Ko	1969-72	10
667A	-	Yankee II	SSN	A	Ko	1976	1
667B	Murena	Delta I	SSBN	A	402,Ko	1973-74	18(14)*
667BD	Murena-M	Delta II	SSBN	A	402	1975	4*
667BDR	Kalmar	Delta III	SSBN	A	402	1976-82	14(3)
667BDRM	Delfin	Delta IV	SSBN	A	402	1984-92	7
667M	Andromede	Yankee-Sidekar		A	402	1970	1
667AT	Grusha	Yankee-Notch		A	402	1982-91	7 rebuilt
670/670A	Skat	Charlie I	SSGN	A	Go	1967-72	11
670M	Skat-M,	Charlie II	SSGN	A	Go	1973-80	6
	Berkut	Charlie III		A	Go	1977	16(15)
671	Jersch						
671R/671W/671K	Victor I		SSN	A	Adm	1967-74	18
671RT	Segma	Victor II	SSN	A	Adm,Go	1972-78	3/4
671RTM/	Victor III				K/	1977	26(3)
671RTMK	Schuka			A	Adm	to 1987	
675/675M	-	Echo II	SSGN	A	402,199	1973-67	16/13
675MU,	-	Echo II					Variants with other
675MK,675MKW	mod.	SSGN		A			rockets, equipment
685	Plavnik	Mike		A	402	1983	1
690	Kefal	Bravo	SSF	D	Ko	1967-70	4(2)
701	-	Hotel III	SSBN	A			
705/705SHMT/					Adm,	1977-	7
705K	Lira	Alfa	SN	A	402	1983	
865	Piranya	Losos		D	Len	1988-90	2
877/877W/							
877EKM	Paltus	Kilo		D	K/L/NN	1980-87 series	27+many exports
885	Jasen	Granay		A	402	began 1/22/1993	
935	Akula	Typhoon II	SSN	A			
940	Lenok	India	ARSS	D	Ko	1978	2(1)
941/941U	Akula	Typhoon	SSBN	A	402	1981-89	6(2)
945	Barracuda	Sierra I	-	A	Go	1984-87	2
945A	Condor	Sierra II	-	A	NN	1990-93	3(1)
949	Granite	Oscar I	-	A	402	1978-79	2
949A	Antey	Oscar II	SSGN	A	402	1986-97	13(2)
(while under construction K-139 Belgorod, launched 1997, in service 1999?)							
955	Borey			A	402	begun 11/2/1996, to be launched 2000, in service 2002)	
971	Schuka or Bars	Akula	-	A	Ko,402	1985-94	16, 2 und. const.
1710	Mackerel	Beluga	-	D	Adm	1987	1
1851	-	X-Ray unarmed	-	A	Su	1986-95	3
1910	Cachalot	Uniform unarmed	-	A	LAO	1986-91	2
06704	Chaika B	Charlie III	-	A	Go	1977	1
10831	-	Norsub V unarmed		A	402	1997	1

Submarine assignment to the fleets

(according to Russian division/designation as of 1997, by which time many changes could have been made)

North Sea Fleet

1st Submarine Flotilla, Based at Sapadnaya Litza, formed June 1961

18th Unit - 6 heavy atomic underwater cruisers, first rank: 4 Project 941 Taifun (TK-208, 13, 17, 20; shipyard/out of service 1996: 202, 12.

11th Unit - 7 atomic underwater cruisers, first rank: Project 949A 1 Oscar II (K-119, 141, 148, 266, 410, 526; shipyard testing 139).

6th Unit - 7 large atomic submarines, Project 945 and 945A Oscar I/II (K-239, 276, 534, 336).

33rd Unit - 16 large underwater ships, first rank, Project 671RTM and 671 RTMK Victor III (B-138, 218, 244, 254, 255, 292, 298, 299, 324, 358, 388, 414, 448, 502, 524, 527).

3rd Submarine Flotilla, based at Gadshyevo, formed 12/14/1969 from 12 squadrons

13th Unit - 7 atomic underwater cruisers, first rank, Project 667 BRDM Delta IV (K-51, 64, 84, 114, 117, 18, 407; shipyard 402 K-51, 84).

31st Unit - 3 atomic underwater cruisers, first rank, Project 667BDR Delta III (K-44, 487, 496) and 2 Project 667BD/667B Delta I (K-447, 457).

24th Unit - 7 atomic underwater cruisers, first rank, Project 09710 Akula (K-480, 317, 461, 328, 157, WEPR, Gepard; Kugar 1998 still under construction) and 1 Project 667M)KS-420), 3 Project 667AT (K-253, 395, 423).

29th Independent Brigade - special-purpose large atomic submarines, first rank, Project 09780 (KS-403) Project 09774 (KS-411) Project 06704 (Berkut).

11th Submarine Flotilla, based at Ostrovny

In the process of reformation. In reserve, submarines of Project 667B, 627A, 675, 671, 671RT, ??

40th Submarine Unit, based at Polyarny, consisted until 1995 of 4 squadrons.

1st Brigade - 10 large Diesel submarines, Project 877 Kilo (B-177, 300, 354, 401, 402, 425, 437, 459, 471, 800).

4th Brigade - large Diesel submarines, Project 641B Tango (B-30, 97, 146, 215, 225, 504, 515, 546 prepared for reserve or taking out of service 1998-99, retained: B-49, 98, and 400/Project 641 Foxtrot).

1 India (BS0257).

Pacific Ocean Fleet

2nd Submarine Flotilla, based at Ribachy/Kamchatka, formed 1973 of the 135th Submarine Squadron

45th Submarine Unit, strategic purpose - 8 atomic underwater cruisers, first rank, Project 667BDR Delta III (K-449, 455, 490, 506, 211, 223, 180, 433).

10th Submarine Unit - atomic underwater cruisers, 5 Project 949A Oscar II (K-132, 173, 442, 456, 186) and 8 Project 971 Akula (K-284, 263, 322, 391, 331, 419, 267; Komsomolsk shipyard: Nerpa).

4th Submarine Flotilla, based at Pavlovsk Bay, formed October 1978, being disbanded and reformed.

8th Submarine Brigade, strategic purpose - 2 underwater cruisers, first rank, Project 667B Delta I (K-500, 530) in reserve state.

26th Submarine Unit - 7 large atomic submarines, first rank, Project 671RTM Victor III (B-242, 251, 264, 305, 355, 360, 507).

19th Submarine Brigade - 2 Diesel submarines, Project 877 Kilo (B-190, B-345); 12 other boats of this type in reserve (B-187, 229, 248, 260, 394, 404, 405, 439, 445, 464, 470, 494).

Baltic Fleet

25th Submarine Brigade

Large Diesel submarines, first rank, 2 Project 877 Kilo (B-227, 806 for training foreign crews), 2 Project 641B Tango (B-307, 312), 3 Project 651 Foxtrot (B-205, 413, 416, 440).

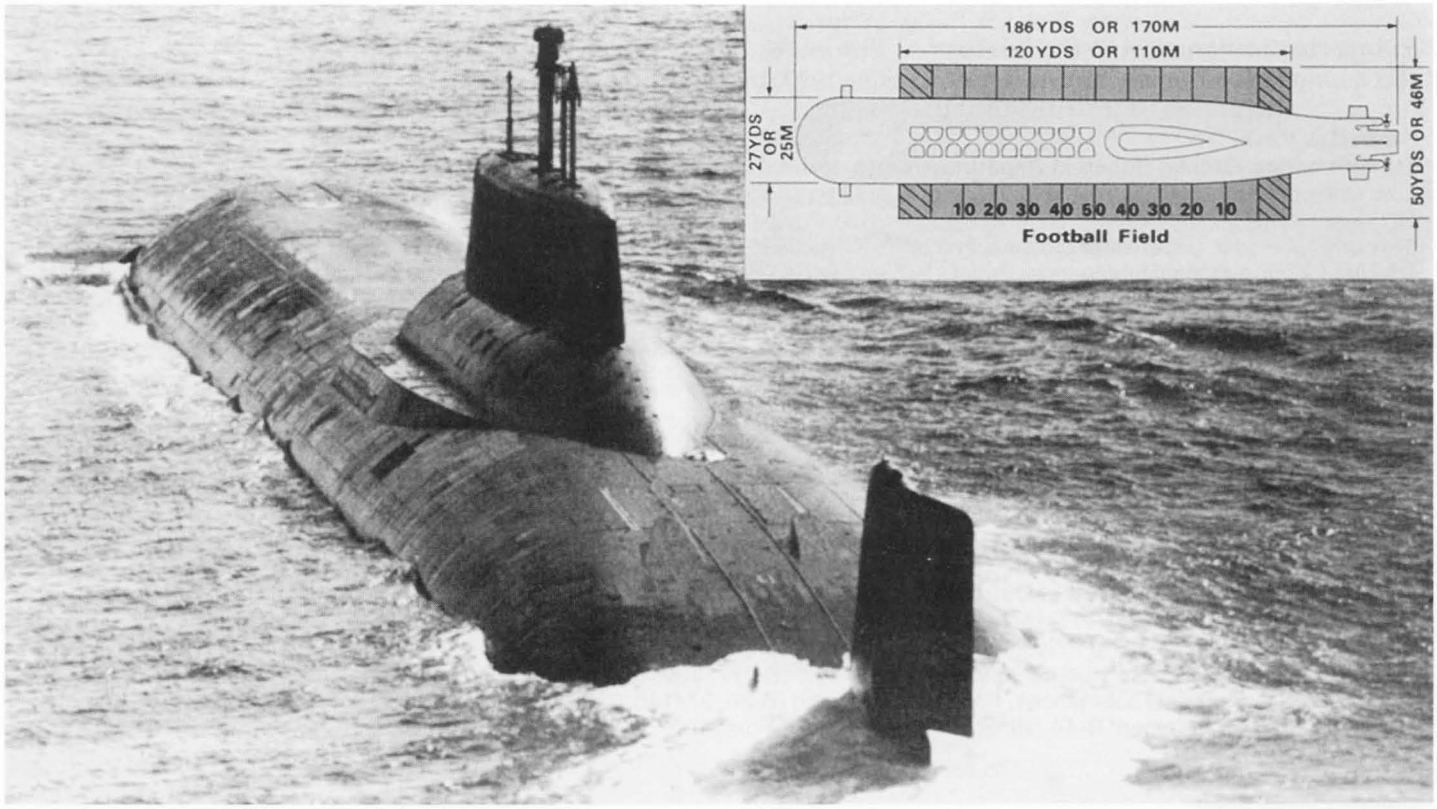
Black Sea Fleet

14th Submarine Unit

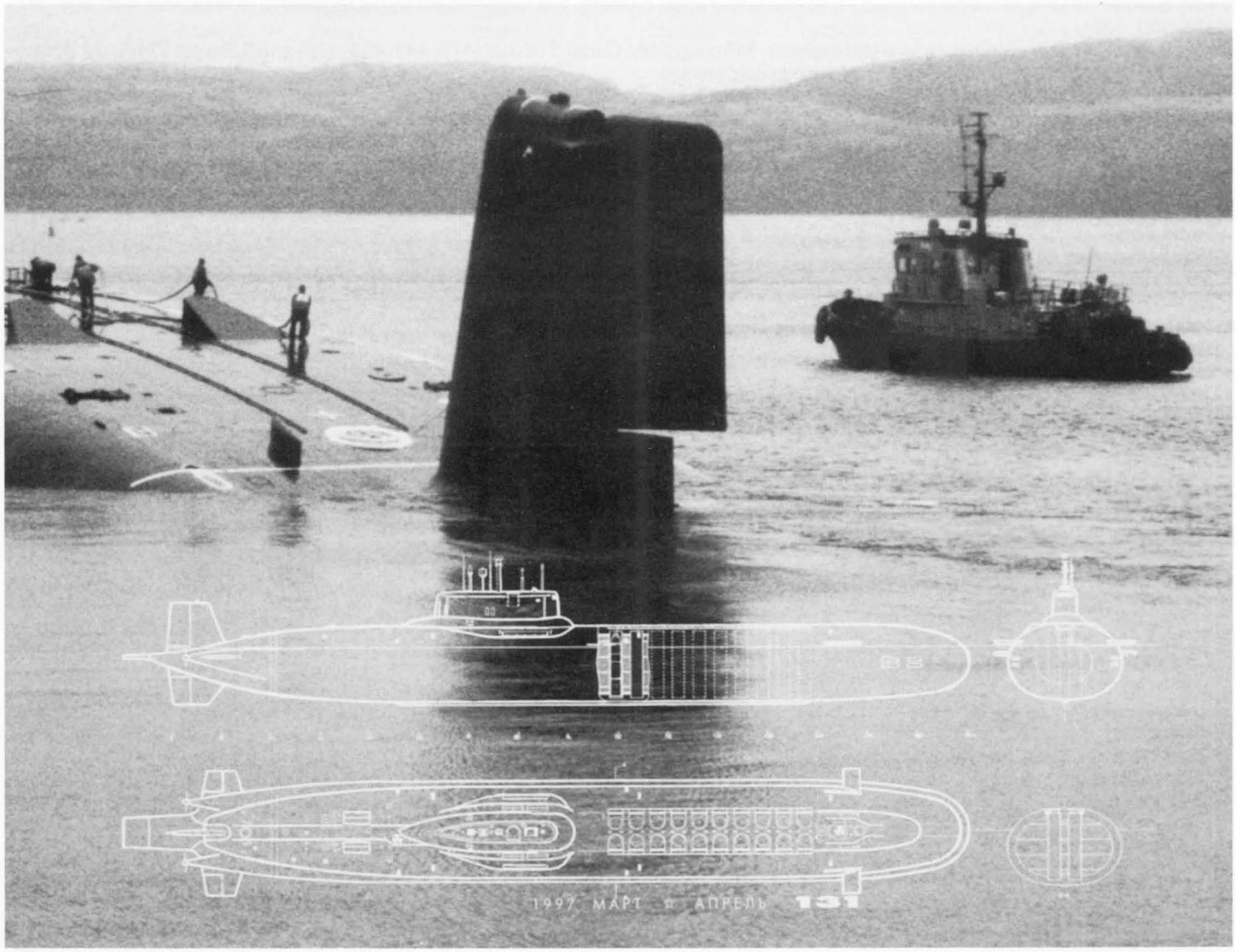
Diesel submarines, 1 Project 877B Kilo (B-871), Project 641 (B-435), 1 Project 1710 (SS-533), 2 Project 690 Bravo (SS-226, 310) and 2 Project 907 (B-488, 490).

Winged Rockets and Missiles of the Atomic Submarines

Complex			P-20M	P-120/4K-85	P-500/4K80
Rockets	P-5	P-6	Amethyst	Malachite	Basalt
NATO	SS-N-3C	SS-N-3A	SS-N-7	SS-N-9	SS-N-12
Designation	Shaddock	Shaddock	Starbright	Siren	Sandbox
Introduced	1956	1964	1967	1972	1975
Range km	550	450	80	150	550
Speed M	0.9	1.3	0.95	0.9-1	2.9
Load kg	Explosive	1000	500	840	1000
or nuclear kt	/nuclear	/500			
length m	10.8	10.8	7.0	8.9	11.7
Wingspan m	3.7	2.5	-	2.6	2.5
Diameter m	1.0	0.9	0.55	0.88	0.8
Launch weight	5.5	5.3	2.9	3.18	4.8
Atomic sub	659				
Project	675	675	670	671RTM	670M
Steering	active	active	661, as P6	as P6	as P6
targeting	targeting	radio command			



The units of the Typhoon class are the world's largest underwater vehicles.



Tactical-technical data for ballistic rockets of atomic submarines

Complex	D-4	D-5	D-9	D-9R[2]	D-19	D-9RM
Rockets	R-21	R-27[0]	R-29	R-29R	R-39	R-29RM
	4K55	RSM-25	RSM-40	RSM-50	RSM-52	RSM-54
	Vyssota	Volna	RIF-M	Shtihl[3]		
NATO	SS-N-5	SS-N-6	SS-N-8	SS-N-18	SS-N-20	SS-N-23
	Serb	Sawfly	Mod1/2	Stingray	Sturgeon	Skiff
Number	3	16	12/16	16	20	16
Introduced	1963	1968	1974	1977-79	1983	1986
Modifications	M.2 79	2:74	2:78	82/87/90	2:89	2:87
	3:81	3:86	3:88			
Length m	14.2	9.65	13.0	14.1	15.7	14.8
Diameter m	1.4	1.5	1.8	1.8	2.4	1.9
Launch wt. t	19.6	14.2	33.3	35.4	90	40.3
Warheads	1	1	1	1,3,7	10	4
Warhead weight kg						
nuclear MT	0.8/1	1	1/0.8 ea.	0.1/0/45	0.1 each	0.1 each
Fuel	liquid	liquid	liquid	liquid	solid	liquid
Stages	1	1	2	2	3	3
Range km	1,400-	2,400-	7,800-	6,500-	8,300	8,900
	1,600	3,000	9,100	8,000		
Atomic subs	667B					
Project	658M	667A	667BD	667BDR	941	667BDRM
	667AU	601,701				

Notes

The details of the technical parameters of the submarine weapons sometimes vary strongly, even in the newest Russian publications.

[1] Variant with radar targeting head - R-27K, R-27U, 1974 for Project 667AU.

Complex D-9U with RSM-40/R-29U rocket for Project 667B.

[2] Three modifications: Mod. 1-3 warhead a 0.2 MT, range 6,500 km; Mod. 2: 1x0.45 MT, 8,000 km; Mod. 3: 7x0.1 MW, 6,500 km, otherwise the details are the same.

[3] Modifications: Stihl 1, 1N, 2, 3A, 3N.

Tactical-technical Data for Soviet Atomic Submarine Torpedos

Type	53-61	53-65K	SET065	SAET-60M	65-76	SET-73
Name	Alligator	Echot-2	Kit			
NATO						
Introduced	1961	1965	1965	1960	1976	1973
Caliber mm	533	533	533	533	650	400
Length m	7.95	7.8				
Weight t	2.07	1.74				
Warhead						
Weight kg	300	205	300			
Use depth m	400					
Range km	15	15	18	20	40	7
Speed kn	35	45	40	42		
Power type	hot gas	hot gas	electric	hot gas	hot gas	electric
Targeting	active	acoustic	acoustic	passive		
Purpose	anti-submarine	universal	anti-submarine		surface targets	anti-submarine

Other Atomic Submarine Weapons for Underwater (anti-submarine) or Surface Targets

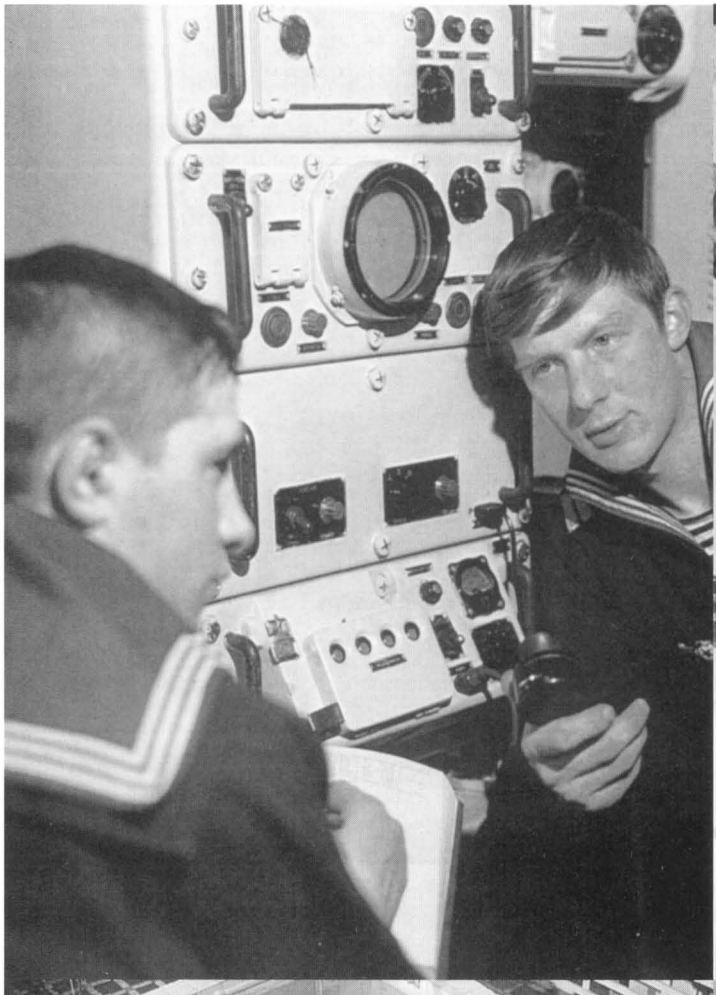
Type	Rocket	Rocket	Torpedo	Rocket	MFK[3]	MFK	Rocket*
Complex	Vyuga	Vodopad	P-700	PK-55	3M70/P1000		
Rockets	4K85[0]	81R[2]	86R/88R	Granite	Granat[2]	Vulcan	
NATO	SS-N-9	SS-N-15	SS-N-16	SS-N-19	SS-N-21	SS-N(X)-24	SS-N-27
designation	Siren	Starfish	Stallion	Shipwreck	Sampson	Scorpion	
Introduced	1972	1973	1979-81	1980-81	1987	1980	
Range km	110	35	120	555	3000	4000	700
Speed	M 0.9	1.0	1	1.5	0.7	3.0	2.3
Charge kg							
Explosive/	500	1,000/	1,000				
nuclear	nuclear	nuclear	500 kt	200 kt	nuclear		
Length m	9.15	6.5	10.5	8.09	13	11.6	
Wingspan m	2.5	2.6	3.3				
Diameter m	0.8	0.53	0.65	0.85	0.51		
Launch weight	2.5	2.4	2.8	6.9	1.7	4.6	
Carrier boat	670M/	949/	667AT/				
Project	670M	661/971	971	949A	971	667M	
Steering	active	its own	its own	its own/			
	targeting	relief program					

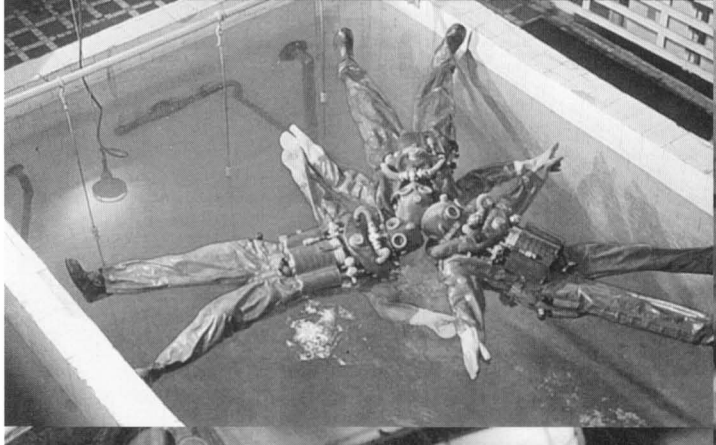
[1] Underwater launch from container.

[2] Launched from 533 mm torpedo tube.

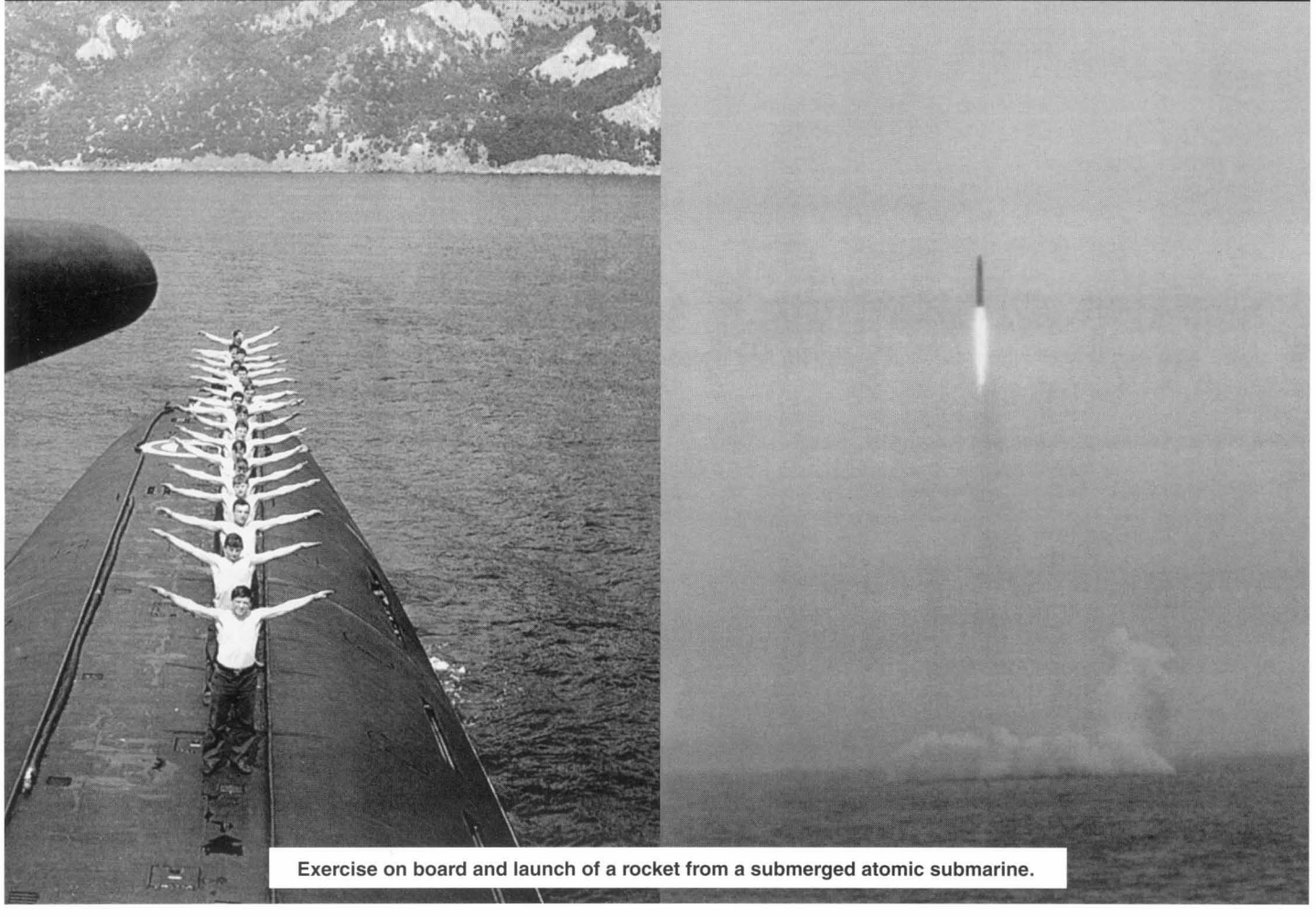
[3] MFK [Marschflugkörper], Russian: winged rocket

*Minimum flight altitude 40 meters.





Training in the various cabinets and battle stations.



Exercise on board and launch of a rocket from a submerged atomic submarine.

Tactical-technical Data of some Atomic Submarines

Project No.	941	667BDRM	0971/09710	955
Fleet name	Akula	Delfin	Shtshuka-B	Boryei
NATO class	Typhoon	Delta IV	Akula	-
Keel laid	TK-208	K-51	K-284	Yuri Dolgoruky
1st boat	3/3/77	2/23/81	1980	11/2/96
Launched	9/23/79	Jan. 84	10/6/82	Plan 2000
In service	12/12/81	12/29/84	12/30/84	Plan 2002
Quantity	6/1 away	7	16, more u.c.	
Last boat	9/4/89	2/20/92	1998	
Modernized	94>Pr. 941U	>Pr. 09710		
Crew[0]	179 (52/85)	135 (41/)	63 (31/)	107 (55/)
Displacement t				
on surface	28,500	11,740	8140	14,720
submerged	49,800	18,200	12,770	24,000
Dimensions*	172.8x23.3 x11.5	167x12.2 x9.8	110.3x13.56[3] x9.68	170x13.5 x9
Diving depth max/min m	400/320	450/380	600/520	450/380
Top speed kn				
surface	19	19	20	
submerged	26	24	35	
Days at sea	120	90	100	100
Powerplant	water pressure reactors	water pressure reactors	water pressure reactors	2 water pressure reactors
Reactor type	2xOK-650	2xWM-45G	OK-6506	OK-650B
Power mw	190 each 2 steam turbines	90 each 2 steam turbines	190 steam turbine	190 each 2 steam turbines
Propellers	2 screw	2 screw	1 screw	2 screw
Armament	**	**		
Complex type	D-19	D-9RM	D-9RMU	
Rockets	RSM-52	RSM-52	RSM-520	
Number	20	16	12	
Bow torpedo tubes	6	4	4+4	4
Caliber mm	533	533	533+650	533
Torpedo types	53-65K, SET-65, SAET-60M, Vodopad roc-t	Torp. + rocket tubes of all types	RK-55, SAET-60M torp, 54-65K no mines	UGST, SAET-60M, Vodopad roc-t
Total	22	12	28	12

All newer types equipped with modern navigation and communication complexes, satellite, radar and television devices, active and passive sonar, and anti-mine systems.

* Overall length (meters) x depth (meters)
[3] over stabilizers 16.4 meters
[0] in parentheses: officers/ensigns/mates
** for anti-aircraft use, 8 extendable AA rockets, Igla-1/SA-N8 Gremlin

Outline of some series of Soviet atomic submarines

Project 627/627A series, NATO designation November Class

Shipyard Works 402

Boat	Project	Works no.	Year built	Tactical no.	
1	627	254	1957	K-3 from 10/9/62 on, Leninski	Komsomol
2	627A	281	1959	K-14	
3	627A	260	1959	K-5	
4	627A	261	1959	K-8	
5	627A	283	1960	K-52	
6	627A	284	1961	K-21	
7	627A	285	1961	K-11	
8	627A	286	1962	K-133	
9	627A	287	1962	K-181	
10	627A	288	1962	K-115	
11	627A	289	1963	K-152	
12	627A	290	1963	K-42 as of 5/8/1981	Rostovsky Komsomol
13	627A	291	1964	K-50	

The twelve Project 627A boats were launched at Works 402 between December 1959 and June 1963.

From 1989 to 1992 the last boats of this project were taken out of service; none were still in the fleet in 1995. In 1989 the SPMBM "Malachite" works turned boat K-3 into a museum ship.

A boat was planned in 1956 as Project P-627A and was to be armed with a P-20 strategic winged rocket (weight 30 tons, range 3,500 km, speed 2,500 kph, design bureau Ilyushin) in its tower. In March 1957 the construction was begun, and in the third quarter of 1960 the government testing was to begin. The February 1960 decision to concentrate on modern underwater rocket carriers stopped this project, and in 1964 all activities in the area of marine winged rockets were halted. The ship's hull and all available components were used for boat K-50.

Project 659 Series, NATO: Echo-I Class

Boat	Works no.	Tactical no.	Keel laid	Launched	In service
1	140	K-45	12/20/1958	5/12/1960	6/28/1961
2	141	K-59	-	-	12/10/1961
3	142	K-66	-	-	12/10/1961
4	143	K-122	-	-	4/13/1962
5	144	K-151	-	-	12/ /1962

Fadevey and B. V. Ivanov. The Project 659 boats served as a pattern.

State testing of K-166 took place in the White Sea, June 11-October 31, 1953, with 2,190 nautical miles covered on the surface and 1,172 miles below. Damage to the ship's hull occurred at a diving depth of 300 meters. Testing of winged rockets in salvo firing was done with K-166. Testing of the improved P-5D rocket complex with launches from containers No. 4 and 8, plus testing of torpedo launching at boat speed of 15 knots. The planned rearming to Type P-7 winged rockets did not take place, with P-5D and P-6 retained.

K-166 was put into service on October 31, 1963. Parallel building of 29 boats took place in two yards from 1963 to 1967.

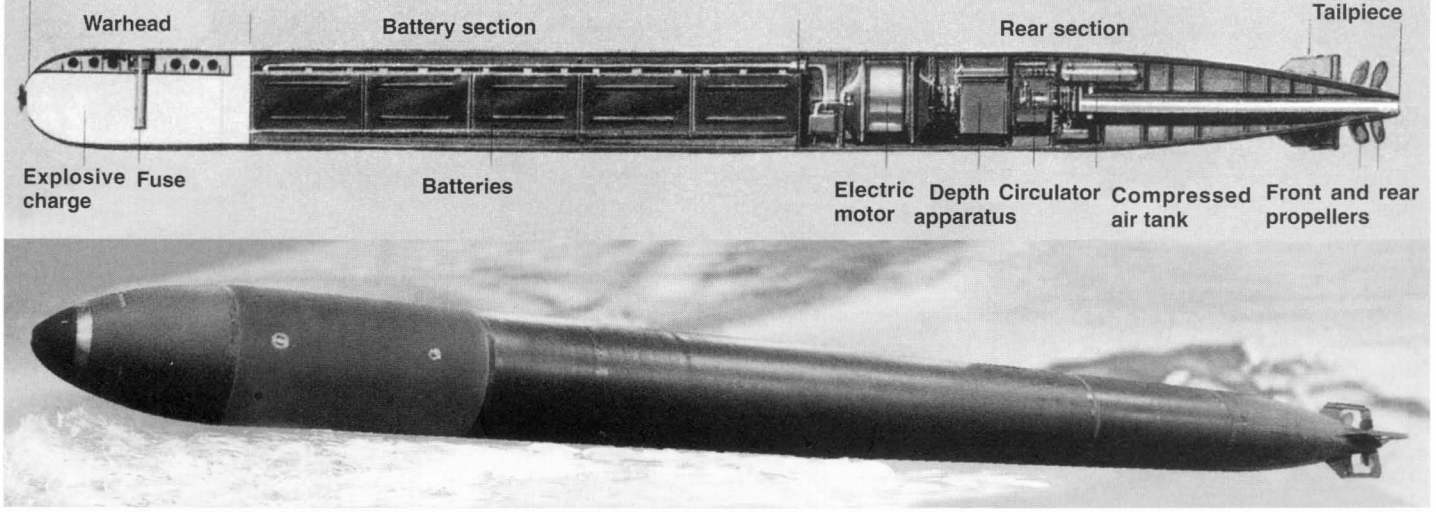
In 1975 boats of Project 675 were modernized to Project 675K or 675MK with the addition of the P-500 "Basalt" rocket complex. With the "Kazatka-B" complex they became capable of satellite navigation. In the eighties, K-1 and K-35 were reequipped with the ZM-70 "Vulcan" rocket complex with "Argon-675KW" guidance system, becoming the Project 675MKW version. The first launch of a "Vulcan" from Project 675MKW took place on December 22, 1983.

Project 675 Series, NATO: Echo-II Class

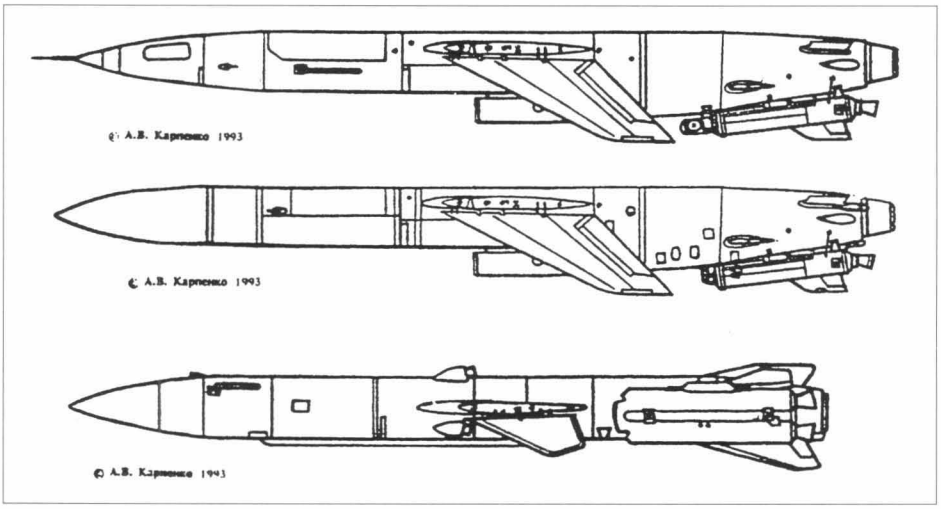
Boat	Works no.	Tactical no.	
1	530	K-166	Shipyard numbers 1 to 16
2	531	K-104, later K-144	Factory no. 402
3	532	K-86	Shipyard numbers 17 to 29
4	533	K-172	Factory no. 199
5	534	K-47	Komsomolsk on the Amur
6	535	K-1	
7	536	K-28	
8	537	K-74	
9	538	K-22	"Krasnogvardeyest" (Red guards)
10	539	K-35	
11	540	K-90	
12	541	K-116	
13	542	K-125	
14	543	K-188	
15	544	K-131	
16	545	K-135	
17	171	K-175	
18	172	K-184	
19	173	K-189	
20	174	K-57	
21	175	K-31, later K-431	
22	176	K-48	
23	177	K-56	
24	178	K-10	
25	179	K-94	
26	180	K-108	
27	181	K-7, as of 1968 K-127	
28	182	K-23	
29	183	K-34, later K-134	

Attack Atomic Submarine Project 675

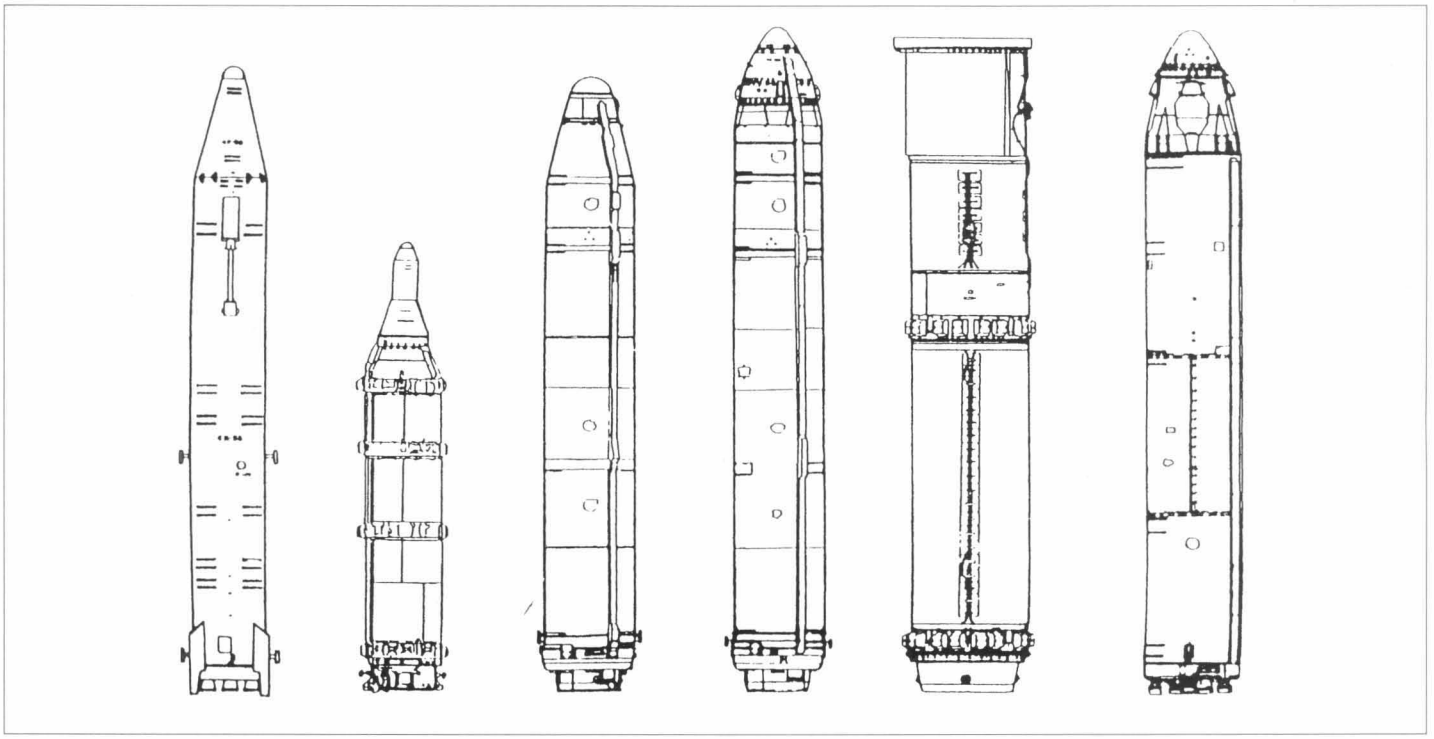
Planning began February 9, 1959, at ZKB-18. Chief Designer P. P. Pustinzev, Responsible for the Fleet M. S.



Above: 533 mm torpedo in cutaway form.
A 533 mm SET-65E torpedo.

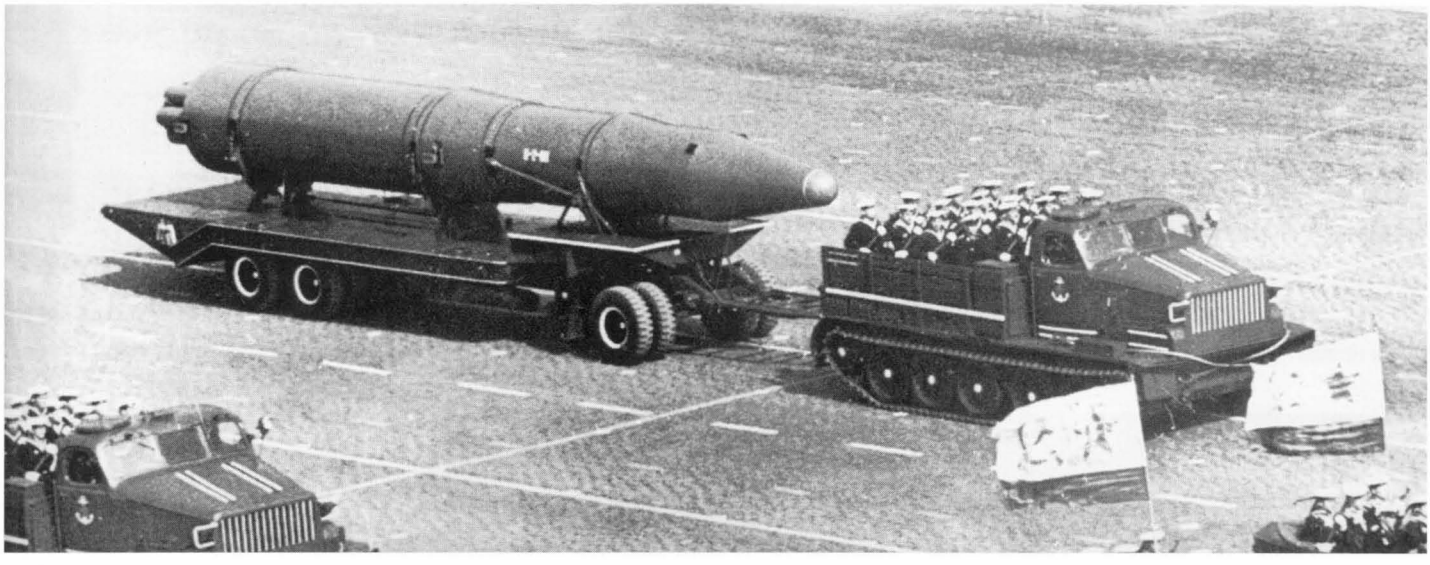


The P-5 winged rocket (above), P-6 (below) and "Amethyst."

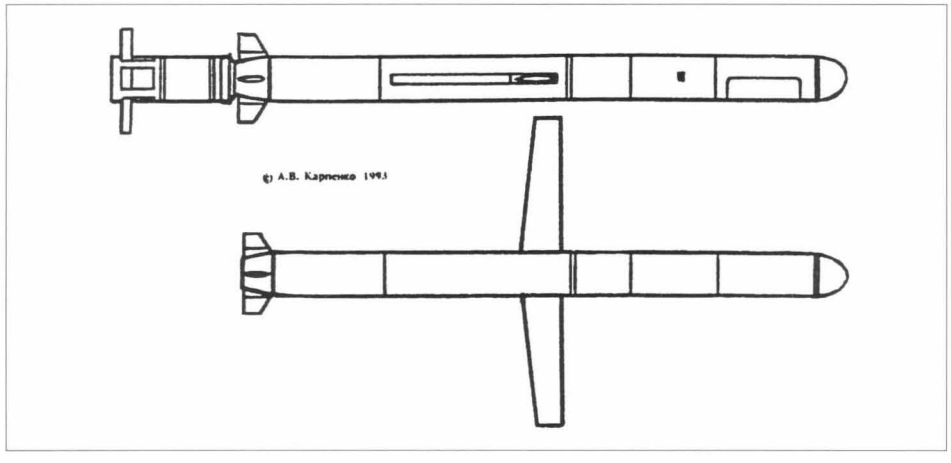


Ballistic rockets of Soviet/Russian atomic submarines, from left to right:
R-21/4K55 Complex D-4 - SS-N-5 Serb, R-27/RSM-27 Complex D-5 - SS-n-6 Sawfly, R-29U/RSM-40 Vyssota Complex D-9 - SS-N-8 Mod. 1/2, R-29R/RSM-50 Volna Complex D-9R - SS-N-18 Stingray, R-39/RSM-52 Complex D-19 Rif-M - SS-N-20 Sturgeon, R-29RM/RSM-42 Complex Stihl D-9RM - SS-N-23 Skiff (from Sovietskiye podvodniye lodki, see bibliography)

In a Moscow parade on November 7, 1968, the RSM-40 "Vyssota" submarine rocket crosses Red Square on an MAZ-537.



A mockup of the R-21/4K55 submarine rocket, here on parade in Moscow in 1962, towed by an AT-T tractor.



The PK-55 rocket (from Rossiskoye Raketnoye Orushiye, see bibliography)

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Voyeny Parad Publishers: Rossia, 117330 Moscow, ul-Mos-filmovskaya 35, Str. 1, phone (095) 143-96-50, 143-96,51, 14396-56; fax (095) 143-96-51, 143-96-60.
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Atglen, PA

Translated from the German by Ed Force

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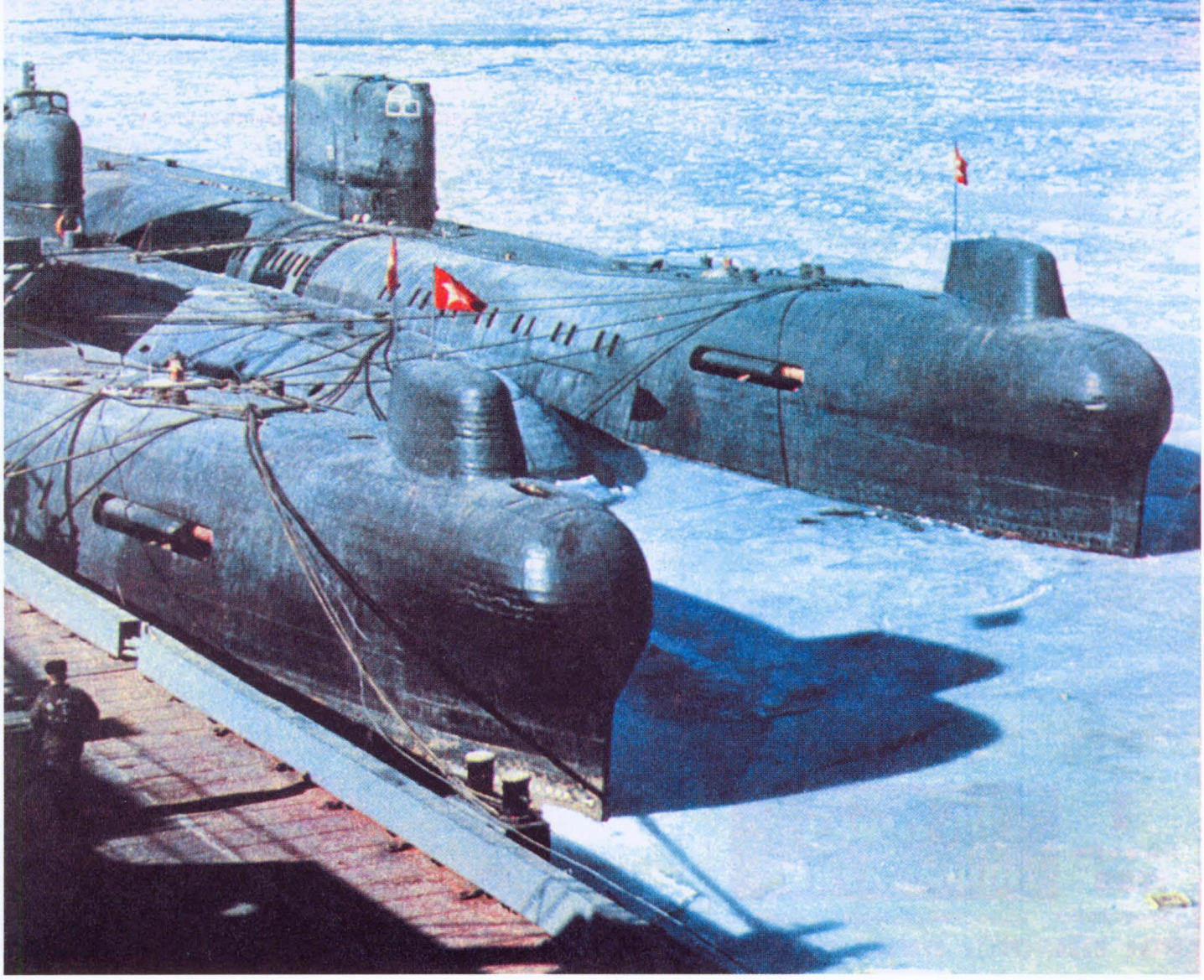
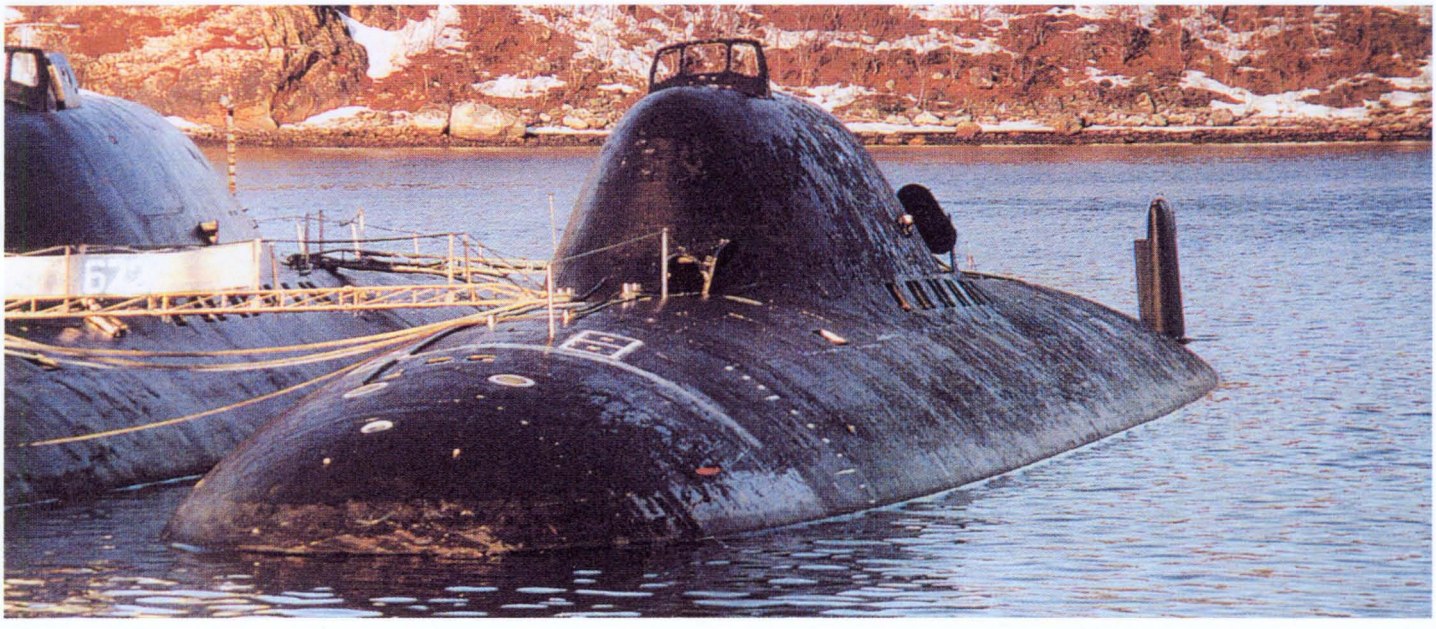
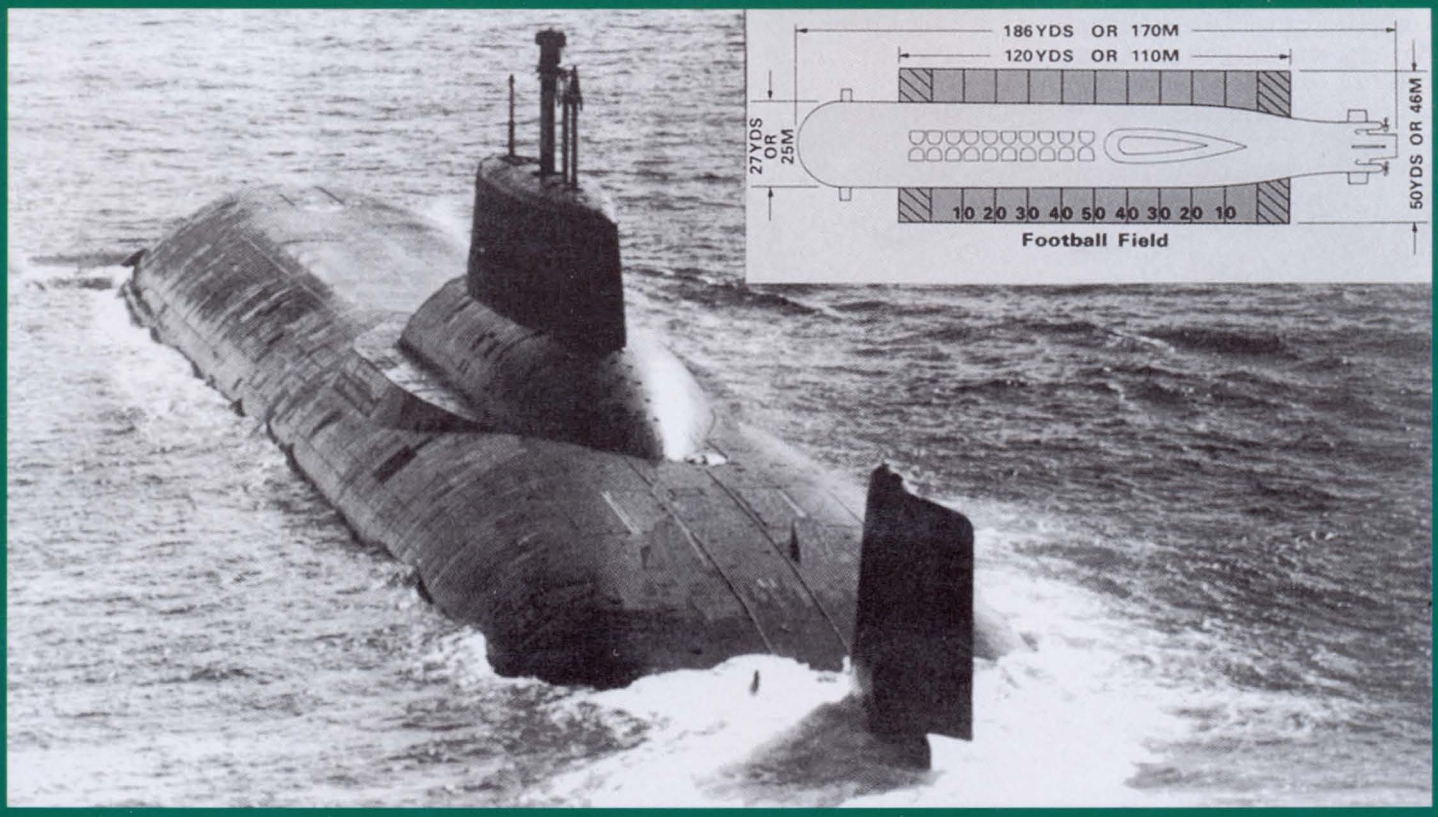


How the times have changed: There was no explanation accompanying this photo of Foxtrot-class submarines in the journal *Technik und Bewaffnung,* 1/88.



The journal *Taifun*, 1/99, included a photo and drawing of Project 705 and continued their series of articles with drawings, data, x-ray views, and numerous details about the history and service of this type, named the designers, and reported on the ballistic missiles of the underwater forces.



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